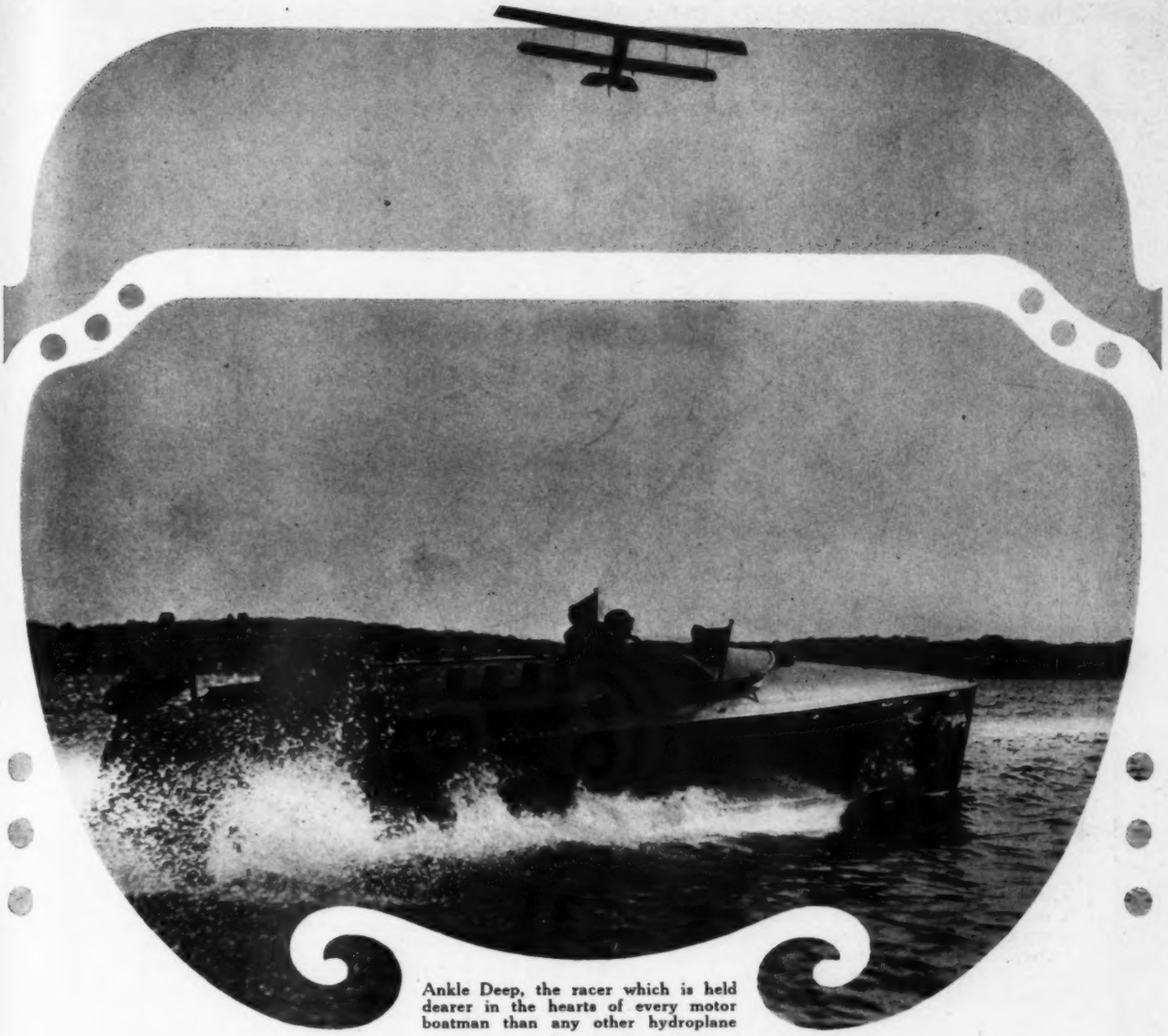

Ankle Deep, the racer which is held dearer in the hearts of every motor boatman than any other hydroplane

Contents, May, 1918

Cover Painting by Burnell Poole

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May, 1918 — MOTOR BOATING — Vol. XXI, No. 5

THE NATIONAL MAGAZINE OF MOTOR BOATING

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Fifty Foot Express Cruiser

The big reason why boats built by us have a certain rare quality of distinction and completeness — which cannot exactly be written into the specifications—is because we absolutely limit our production to boats of the highest quality.

The Fifty Foot Great Lakes Express Cruiser is a typical example of the highly efficient, highly desirable boat built by this organization.

A Fifty Foot boat with comfortable accommodations for a party of eight and a crew of two. Speed possibilities from 20 to 24 M.P.H. Fully equipt in every little detail.

Two Such Boats Now Ready for Delivery

In addition to the boats already contracted for, we have two of these Fifty Footers completely finished and ready for delivery right now. It is suggested that you wire for additional data or for a reservation, as necessarily all orders will be filled strictly on priority of receipt. Booklet No. 9-M describes this boat.

GREAT LAKES BOAT BUILDING CORPORATION

Designers and Builders of Boats of Distinction and Quality

Milwaukee Wisconsin

Fifty-Two Foot Express Cruiser

A slightly larger boat than the Fifty Footer and with slightly different interior arrangements. The engine compartment, instead of being entirely located under the Bridge Deck, is partly housed in a trunk cabin, which also affords accommodations for the crew.

Accommodations briefly consist of steward's quarters forward, followed by large and completely equipt galley, then a big forward stateroom with connecting toilet and berths for four people. Aft of this is located the Bridge Deck and engine room trunk cabin, followed by splendidly equipt Owner's Stateroom with connecting toilet, clothes lockers, etc., with entry to the after cockpit—a pleasant lounging place.

Two of These Boats Ready for Delivery

Two of these Fifty Two Footers are also subject to immediate order and delivery. Anticipating the demand for this rather remarkable boat we have carried a manufacturing schedule through our factory during the past winter and now can offer two of these boats for immediate shipment. Wire or write for details—ask for Booklet No. 10-M.

GREAT LAKES BOAT BUILDING CORPORATION

Designers and Builders of Boats of Distinction and Quality

Milwaukee Wisconsin

GREAT LAKES CRAFT

MOTOR BOATING
THE NATIONAL MAGAZINE OF MOTOR BOATING

Photograph by Rosenfeld

Club houses of the New York Motor Boat Club and a glimpse of the Hudson just above their anchorage where in a few weeks thousands of motor boats will be moored

Motor Boating This Summer

No Interference with Pleasure Boating by Naval Authorities Contemplated—Keep Away from Waters Where There Are Naval Ships—Ways in Which Motor Boatmen Can Help the Government

By Charles F. Chapman

MOTOR boats and yachts used for pleasure purposes will not be molested in any way during the coming summer provided they do not attempt to navigate upon or cross one of the very few barred zones which the Navy Department has established at the entrances of several ports on the Atlantic seaboard. Even for those boats which must or desire to sail in the vicinity of these barred zones a way is provided, although it will be necessary to show the naval patrol boats on duty certain credentials which will be issued by the Navy Department to American citizens upon proof of their intentions. Other than this, motor boating and yachting will not be interfered with by naval vessels any more than it was in 1917. Those who sailed last year know that as long as their boats, their crew and passengers behaved themselves and did not attempt to trespass where they should not, that there was no attempt made by any authority to curtail or spoil in the slightest manner the king of all sports.

There is no reason why the cruises which you have planned for the coming summer cannot be carried out, why any of your week-end runs need be called off or fishing trips abandoned. The only hardship which will come is to those motor boatmen who live in the vicinity of the Narrows in New York City and who have been accustomed to pass out to sea for their week-end trips. But even this is not the hardship which many motor boatmen have been led to suppose it is.

If some of the users of boats would look at the

(*Cont'd on page* 90)

In Order to Use Your Boat

1. **Get a Navy Department Permit from the Commandant of your Naval District (if you obtained a permit in 1917, you will not be required to obtain another) and carry it aboard at all times.**
2. **Have on board the receipt showing that the war tax on your boat has been paid.**
3. **Be sure you can prove (if called upon to do so) that you have no alien enemies aboard.**
4. **Find out the location of any barred zones from the Commandant of your Naval District and keep away from them.**
5. **If you wish to go out to sea, get a special permit from your naval headquarters.**
6. **Have full equipment aboard as required by law.**

How You Can Help Win the War

1. **Keep away from waters where naval operations are in progress.**
2. **Do not sail close to or tie up to piers used by ocean liners or coastwise ships.**
3. **Carry none but loyal American citizens aboard your boat.**
4. **Don't talk about what you see while you are cruising.**
5. **Obey the orders of the Sectional Patrol boats (marked "S P" on the bow) if they signal to you to come alongside.**
6. **Confine your cruising inland and away from entrances to important sea ports. Do not go out to sea unless it is absolutely necessary.**

Motor Boat Heroes

The Sterling Qualities Necessary in the Men of the U. S. Coast Guard Who Risk Their Lives to Save Others

By C. A. Harbaugh

THERE are no better boatmen in the world than the fishermen of our salt-water coasts, whose vocation requires them to launch and land through the white-caps.

Boating of this sort is a contest with one of Nature's undependable forces in its most fickle mood; a contest requiring of the boatmen quick wit, keen judgment, a high order of courage, and seasoned and responsive muscles.

What, for instance, would be the predicament of a party of landsmen finding themselves in the situation of the boatmen seen in the picture bucking the breakers. One illustration shows a life-saving crew on the New England Coast going off to a wrecked ship. It may be stated incidentally that these men safely negotiated the breakers seen approaching over their bow, and accomplished their errand of rescue as only men trained from boyhood in surf boating and surf fishing could have done.

One learns with surprise that deep-sea sailormen are poor boatmen and swimmers as a rule. Indeed, a considerable proportion of them have nothing on the average landsman when it comes to these two kindred accomplishments. Moreover, few sailors know there is any great difference between pulling a boat on the oily swells of the open sea and doing the same thing in the thick of a shore surf. Therefore, it often occurs that when sea and wind threaten the destruction of a stranded ship her terrified crew lose no time in taking to the boats. This means of attempting to escape accounts for a large proportion of the fatalities that occur in connection with shipwrecks caused by stranding. Those who try to save themselves in this way during the prevalence of a high surf stand less than one chance in a hundred of reaching shore alive. If the boat is not swamped or battered to pieces before it is free from the davits, it is almost sure to be overwhelmed by the first wave that comes along after it leaves the vessel.

The patrol

Landing a life boat through the breakers

So long as the whitecaps frolic between wreck and shore the safest place for the imperiled company is aboard ship, even if they have to climb into the rigging to keep clear of the waves. This is so because there is always the chance that they will be discovered in season by Uncle Sam's beach patrol, which now covers every stretch of our coast where rock and shoal lie in wait for the prey that comes to them out of the storm and the fog.

Rescues from shipwreck are generally effected by means of the breeches buoy if the wreck lies within range of the line-throwing gun. Otherwise, resort must be had to life-boat or surf boat.

Motor boats are now extensively employed for this work. But the motor has not yet entirely replaced the muscle and surfmanship of the professional life-saver, and never will. This for the very good reason that a boat propelled by oars may be more readily maneuvered in the rough water usually found in the locality of a wreck.

Witnessing a crew of these veteran boatmen launch off an unprotected beach in the teeth of a gale, one can but marvel at the effectiveness of their method of going about their work.

The boat must be shoved bow-first into the water immediately after a wave breaks upon the beach, and the oarsmen must be in their seats and under way in a space of time measured by a few fleet seconds. A moment's delay in getting on board and to their oars, or the slightest miscalculation of judgment on the part of the boat captain in giving his

(*Continued on page* 62)

AiR BoatinG

A DEPARTMENT ESTABLISHED IN THE INTERESTS OF HYDRO-AEROPLANES AND FLYING

For many months we have emphasized the importance of the aircraft in the country's war program.

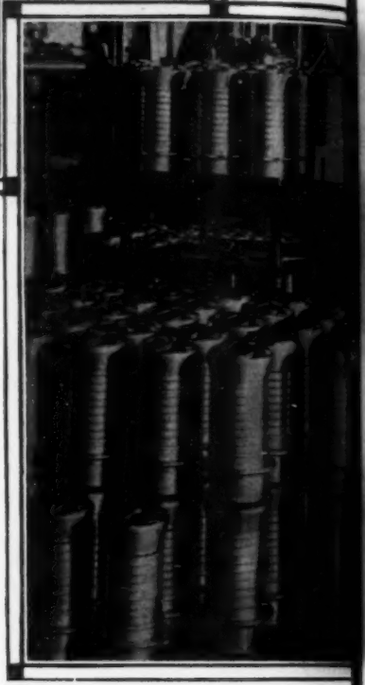
We have pointed out the relation between the ship of the sea and the ship of the air.

We have traced the development of the boats which fly and their power plants and showed how this development is distinctly the result of the work and brains of those in the motor boat and marine engine industries of the last few years. The racing hydroplane and its power plant with which we all are familiar is the father of the modern aircraft.

AiR BoatinG's *reason for existence has been firmly established and it will appear as a regular department hereafter.*

The first plane used by American aviators in France

Just a few plane bodies in an American factory



Parts of many airplane motors in an

America's O

The Airplane and

By Captain Norman H. Read

THE world is looking to America as the deciding factor in the war. She has already made a great contribution to the diplomatic and moral aspects of the conflicts. She has not as yet made the technical and tactical contributions which are required in the present situation.

The greatest and the speediest of possible American achievements lies in the development and operation of large fleets of super-airplanes.

Three years of warfare find the Allies and Germany still in a deadlock so far as their armies and navies are concerned. The old arms of service and the strategies of previous wars have left the present issue undecided.

Along with the failure of more strictly military manœuvring may be noted another significant fact—the increasing effort on both sides to strike through the economic situation of the enemy, to radically affect the food supply and the communications of the fighting forces. Germany has made this attempt through her submarine activity; the Allies are making it through the commercial blockade. The relative effectiveness of these two methods seems still to hang in the balance.

All these considerations make it evident that it is the opportunity and the duty of America to develop the airplane to a far greater extent than we have done or are doing!

The objection that we are already doing what is herein suggested can be taken only as evidence that we have failed to realize what may and what must be done.

The program may be briefly set forth as follows:

First—The construction of larger machines of greater carrying capacity and cruising radius than any now building or planned for.

Second—The transportation of these machines under their own power by transatlantic flight. This factor making for

a—speed in delivery,
b—economy in assemblage,
c—relief of shipping congestion,
d—defiance to the submarine.

Third—The use of these machines in bombing operations in Germany against:

a—sources of supply,
b—depots and strategic centers,
c—lines of communication.

The possibility and feasibility of such a program may be questioned by the layman but not by those men competent to judge, by those most acquainted with airplane construction and operation.

While space and time is not available, and while policy does not permit the publication of details regarding the project, the following facts may make it quite evident to the reader that

A wireless equipped biplane in France

American factory ready for assembling

Two American aviators now in France—Lieut. Young and Lieut. Brown

Opportunity and the War

H. Read, R. F. C.

Photographs Copyright by Committee on Public Information

its complete fulfillment is both imminent and important.

a—Machines approximating the desired type are beginning to appear in such warplanes as the Caproni, Handley-Page, and similar models.

b—With smaller and more ordinary types of machines flights have been made closely approaching the distances and times required for the proposed transatlantic trip.

c—The success which even a slight airplane dominance has given in critical situations in the war to date makes it evident that such operations on a larger scale offer the most promising field of activity of the whole war.

Why America must adopt this program:

a—It can be speedily carried out. Time may mean victory or defeat.

b—The air is the one field in which Germany is weak and in which we may, if we will, be strong.

c—The development of such a program can double or treble the effectiveness of the Allied armies and navies already in the field.

d—America may make for herself an instrument that will serve her not only as a decisive factor during the war, but open to her pre-eminently a field which must henceforth remain the highway of man.

The present German lines on the Western front are by no means the strongest defensive ones they can assume. Supposing the Allies were able to force the Germans to withdraw. What would happen? They would be falling back off the flat, open and difficultly defended plains of northern France and Belgium to ever naturally stronger and shorter lines of defense. First the line formed by the Somme and Meuse Rivers with the mountains of southern Germany and Luxemburg, then the Moselle and finally the great Rhine itself, an obstacle so naturally strong that a comparatively small force can hold it against an enormously greater one.

It would thus seem beyond possibility that the Allies can conquer with their sea or land forces in the present mode of warfare. But Germany must be defeated, so how then can they do it?

"Let them close all passages on earth and sea; the heavens are open, and it will be through them that we shall pass."—Ovid.

If the Allies were to build a great number of large machines carrying three or four tons of bombs each, if these machines were to fly, day after day, night after night, over Germany, dropping their loads of bombs upon the munition factories, the railways, bridges, and upon the roads, soon the supplying of the troops at the front would be so seriously interfered with that

(*Continued on page* 60)

Our Air Boat

Speed, Ability to Climb Rapidly, and Weight-Carrying Capacity Involve Differ Motor, Efficiency of the Propeller and Sp

By C. H.

IT is a curious phenomenon—this growth into our social and national life of some new invention, without our really understanding anything about it. Telephones, electric lights, the storage battery, the common desk fan, and a hundred other everyday adaptations of the discoveries of science get interwoven into our daily affairs without our having more than the most elementary understanding of their how.

And now, slowly with its difficulty in making headway against the inertia of public sentiment in peace time, and much more rapidly with the demands of war, the airplane is forcing its way into our vision. Already it carries passengers; it is soon to carry mails; the next ten years will see it displace more than one ferry, and there seems small doubt that, in its marine form, it will get the love of many a waterman who has hitherto found outlet for his energy and his love of matters marine in the motor boat.

Yet not one man in a thousand understands anything more about an airplane, or how it is built or why it is so built, than that it possesses some surfaces, an engine and a propeller.

Why are some airplanes fast and others slow? Why do some appear squat and fat, and others wide and slender? Why can some climb up high very fast and others but crawl aloft? Why are some built with two "wings" (the pilot never calls them so!) and others with four? Why is the top wing set forward of the bottom one? Why do their centers sink lower than their edges? Why is the lower wing somewhat behind the top one? Why isn't the body of the machine under both wings to give an unobstructed view down, or on top of both wings to give an unobstructed view aloft? Why is a side slip, a nose dive, a spiral, a glide, an accident?

Ask yourself, ask your friend, ask almost every one whose life does not bring him intimately in touch with aeronautics, and see that, like the telephone, we all accept the air boat or the airplane, as a fact, without in the least understanding why it is a fact!

When, ten years ago (so short a time for the progress made!), the first tentative airplanes were built, any machine was a good machine which got into the air and stayed there. Now no machine is a good machine just because it will fly, any more than any automobile is a good automobile because it will run. The airplane of to-day must function according to its design, or it is no good. Doubtless, the first savages to dig out a log found the resulting boat a good boat, but to-day the hull is most carefully designed for size, speed, resistance, carrying capacity, beauty, and efficiency, and if it doesn't meet its designer's hopes and plans it's a poor hull.

So with the air boat. But like its big brother of the water, the air boat is not, as yet, anything but a compromise. No one has as yet designed a water-going structure which has the maximum of speed, safety, carrying capacity, and beauty, all at once.

And no one has as yet designed any sort of flying structure which is anything but a compromise.

To understand why, it is necessary to know why an airplane flies at all. When a surface is inclined to a stream of air, the air is compressed on one side and rarified on the other. If the inclination be downward, from fore to aft, the result is a lifting force.

The airplane has such an inclined surface or surfaces. The stream of air comes from its motion through the air, which is caused, of course, by the propeller. But no surface is weightless—nor is an engine a man, the fuselage he sits

Truing up the framework of an air boat, a job requiring considerable skill and much careful work

Hydroaeroplane about to leave the water after attaining sufficient speed to have the required lift

Design a Success

ences in Design that Cannot Be Combined in One Machine—The Power of the eed when Flying Are Important Factors

Claudy

in, the wires, struts, wheels, etc., which form the completed flying machine. So the lifting force must first overcome the weight before the whole can get off the ground or out of the water.

The result is that the total force available is used in two ways—one for the lift, and one part to overcome drift, which is the engineer's term for the resistance of the planes as such. Head resistance is the total of the skin friction and the resistance of all the parts of the structure which strike the air without giving any lift.

Obviously, the greater the proportion of lift over the drift the more the machine can carry and the faster it can climb. The greater the angle of incidence at which the planes strike the air the greater the lift, but, also, the greater the drift. Now, the longer the plane from tip to tip the greater the surface—the greater the surface the less the angle must be to produce the necessary lift, and the less the angle the less the drift. Therefore, argues the theorist, planes of tremendous width and little depth are most efficient!

But! Planes require ribs, and ribs require strength, and strength requires size. The camber or curvature of the top and bottom of a plane must be just right for the particular angle of incidence being used. The less the angle the less the camber, and, consequently, too wide wings with too little curvature will have no room for the parts necessary to produce strength.

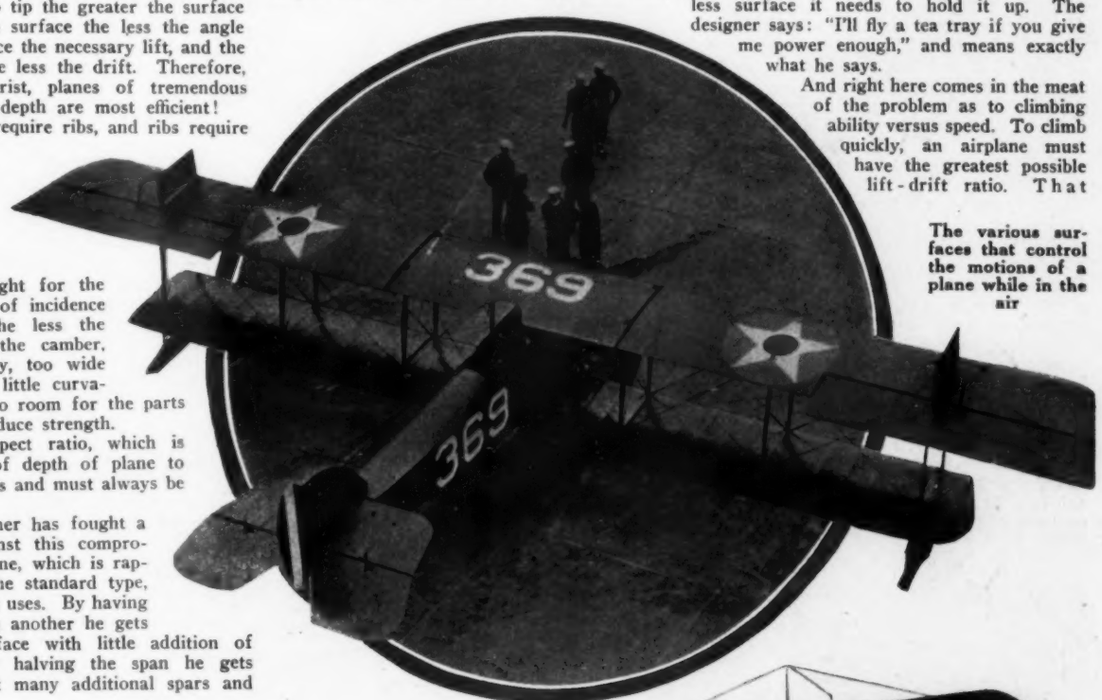
Hence the aspect ratio, which is the proportion of depth of plane to width of plane, is and must always be a compromise.

But the designer has fought a good fight against this compromise. The biplane, which is rapidly becoming the standard type, is the weapon he uses. By having one plane above another he gets double the surface with little addition of weight, and by halving the span he gets strength without many additional spars and wires; and while he does increase head resistance with two planes instead of one, his planes need not be so strong, and therefore not so thick, his angle of incidence may be less and so his drift is less.

But compromise still persists. Roughly speaking, the bottom of a moving surface compresses—the top surface sucks—air. If one is above another, the top surface of the bottom plane sucks air and prevents the top surface from having its maximum compression. To increase the distances between the surfaces is the first thought, but that means longer and heavier struts, more wires and more head resistance, top heaviness and other similar troubles. So compromise comes into play again and the planes are staggered—that is, the bottom one is put somewhat to the rear of the top one, to get it out of the way of the air reaction. Again, the top surface or plane is built out on the ends (overhung) as wide as can be accomplished without needing struts to hold it up, thus getting so much extra free surface for compression and sucking lift.

Strange as it may seem, this suck or rarification of air on top of a moving surface has a greater effect as a lifting force than the compression of the air below the moving surface. It is not a matter of belief, but of actual proof in the wind tunnel, where aerodynamic experiments are made. Moreover, the lift, which is composed of both the sucking and the compressing of the air over and under the moving surfaces or planes, increases rapidly with the speed of the whole through the air at about the square of the speed, so that the faster the plane the less surface it needs to hold it up. The designer says: "I'll fly a tea tray if you give me power enough," and means exactly what he says.

And right here comes in the meat of the problem as to climbing ability versus speed. To climb quickly, an airplane must have the greatest possible lift-drift ratio. That



The various surfaces that control the motions of a plane while in the air

Aeroplane preparing to leave the ground. It must travel along the field until the required speed is attained

means a slow plane, because the head resistance of all those parts of the structure which do not produce lift—wires, struts, skin friction on the body, etc.—increases as the square of the speed; and the greater the head resistance, of course, the more of the total power must be taken to overcome it and the less there is for lift. The slower the plane the larger must the surfaces be, and the larger the surfaces are the greater the weight. The more the weight the greater the angle of incidence must be to afford lift, and increased angle means increased drift, and—the compromise comes in again!

For speed, small surfaces just enough to lift the weight are required; a small angle, cutting down the drift, which means small camber or curvature, also cutting down the drift.

Put categorically, for maximum speed plus maximum climbing ability, what is wanted is great span, little depth, two angles of incidence and two cambers to the surface (an absurdity), no thickness to the surfaces (an impossibility), and a propeller which has an alterable pitch to be most efficient at any speed (which, if not an impossibility, hasn't been invented yet!).

But the end of the problem of speed or climbing ability is not yet. An airplane or boat is so constructed that when on an even keel, the propeller shaft horizontal, there is sufficient lift, and just sufficient lift, to keep the plane slowly rising in the air. To rise more rapidly the pilot alters the angle of the elevator, or "horizontal rudder," tipping the nose of the machine upward and making the surfaces have a greater angle of incidence. The greater the angle the greater the lift (within limits, of course), but also the greater the drift. The greater drift lessens the speed, which also lessens the lift. Somewhere between a level flight and pointing the nose straight up is the maximum possible angle of flight—the critical angle. At this angle the machine does not climb—it staggers along horizontally through the air, its lift just equal to its drift plus gravity. Force its nose higher and it commences to fall.

Somewhere between a level and the critical or maximum angle is the best climbing angle. This best angle may result in 1,000 feet a minute in a good climber, or from 4,000 to 5,000 feet in ten minutes if it is a good all around machine. In a very fast plane it will be a very slow climbing speed, for fast planes have small sufaces, little angle (to reduce drift), small camber, to go with small angle, and none of these things makes for lift. It is the motor boat over again—one cannot have great speed and plenty of room—great speed and small engines do not go togther, and the speed boat built for cruising is neither speedy nor a cruiser!

But the designer's problems only commence when he has settled speed versus climbing ability. He has the stabilities to care for, and they are very important, indeed, especially to the pilot. In the water the motor boatman can control his speed and his direction, but if speed dies away he still exists. The air boatman must control speed and direction according to the compass, and direction up and down, and must balance his craft laterally and fore and aft and never forget the peculiar-to-the-air condition which the working of the law of momentum and inertia produces in a craft, the only hold of which on the medium in which it exists is due to speed.

The yachtsman keeps from going crab-wise by keel or centerboard. The autoists turn a corner with the aid of friction between wheels and road, to which he adds with chains in slippery going. The motorcyclist has a banked track on which to make speedy turns. All have something solid or at least a liquid heavy with inertia to work against. The air boat has only thin air.

Consequently, the air boat must be built so that it won't change its course with every gust that blows. To do this it must have more keel surface behind than in front of its vertical turning axis, like a weathercock, that the

(*Continued on page* 44)

Sewing the linen along the edge of the wing

The completed wing receiving the final coat of varnish before assembling the machine

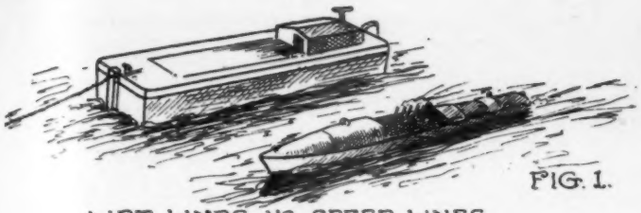


FIG. 1.

LIFT LINES VS SPEED LINES FOR WATER CRAFT

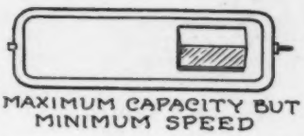


FIG. 2

HIGH SPEED BUT SMALL CAPACITY.

Plane Facts

The Principles First Developed by American Inventors Which Made Air Flight Possible Now Used by the Fighting Forces of the World

By William B. Stout
Technical Advisor to the Aircraft Board

THERE is no mysterious secret of airplane flight. The facts regarding aeronautics which one must know to be able to design a machine that will get into the air and fly, are comparatively few and very simple. As these articles progress, however, you will recognize there is a vast difference between a plane that will merely fly and one that has performance, just as there is a difference between a Hudson River scow and a Gold Cup defender. One boat will float and can be hauled through the water only by main force; the other is a refined thoroughbred product of high-class engineering minds. Many made the mistake in the early days of the war in thinking that anything that would fly was an airplane. The last three months have taught us the difference between mere flying and the ultra refined ship of the air of to-day. In designing a boat for use in the water, one selects a capacity or displacement of a shape below water and a shape above water to fit the conditions of speed, cargo, weather, and temperament which the boat will have to meet in the use for which it is intended. A stern-wheel Mississippi steamboat could not navigate the Bay of Fundy nor could an ocean-going yacht take its wealthy owners through the wonderful beauty of the upper Mississippi. A passenger boat for carrying excursions in the daytime from the city to some near-at-hand park or resort with the same interior arrangement would not do for trips of several days' duration. An ocean liner designed for passenger work can hardly be changed into a battleship. Each outline is designed for its own particular work and requires different specifications, engineering and knowledge in order that analyses resulting from this knowledge may result in a ship which will fit requirements demanded.

The same statements are true to-day in connection with airplanes; new as the industry is. If one thinks that because the airplane is only a few years old, it is not a developed product, he is certainly not in touch with what planes have accomplished in the air in the last few months. It cannot be said that the eventual types of planes can even be imagined but it can be said that planes can now be designed with accuracy for certain performances on paper: and that when they are built, the performance can equal that laid down as nearly as in the case of ships for work on the water.

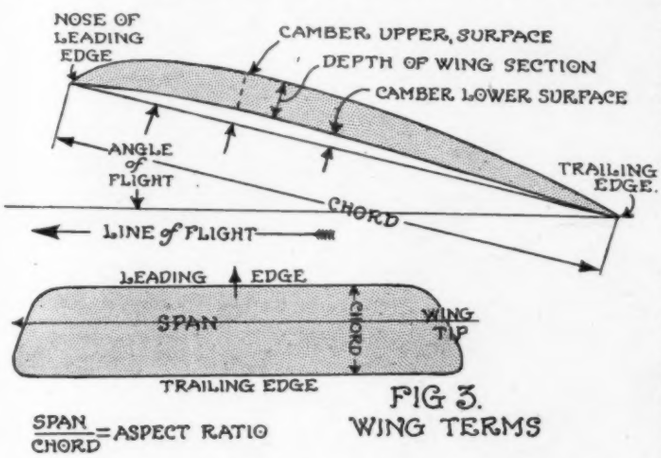


FIG 3. WING TERMS

In a ship, very much depends on the contour of the curve of the ship from stem to stern at the waterline. For the purpose of analogy, we will ignore the difference in section and depth and discuss the effect of this curve alone on ship structure. For an Erie Canal boat, one wants maximum capacity, minimum cost and care nothing for speed. Therefore, the front end of the canal boat is blunt, offering greater resistance to forward travel at speed but much lift, and no amount of horsepower crowded into an Erie Canal boat could turn it into a speed creation. The speed must be inherent in a boat itself. If we want a speed motor boat, we can take the same length as the Erie Canal boat, narrow down the hull, sharpen the prow, streamline from the widest part of the hull to the stern post, and thus by designing a hull which slips through the water with the least resistance and leaving the least wake behind, can accomplish great speed but with much less capacity.

The airplane is much the same. In considering the airplane, however, we must change the waterline contour we used in the boat to give us the characteristics we want where the pressure is always on one side of the boat instead of straight fore and aft.

Figure 3 shows the different parts of a wing curve with the nomenclature of the different parts. The distance from the front edge to the rear edge of the wing is known as the chord. The curve of the wing from the chord line is known as the camber, there being a different camber for the upper surface and the lower surface. If the wing is to fly at a steep angle against the wind, its lower surface has a deep camber. The smaller the angle at which the plane is to fly, the more nearly will the wing curve approach the contour of a speed boat at the waterline; a curve from the front to the rear giving the camber; this being practically at the angle at which the plane will fly as shown in Figure 4. It is as though you took the boat and built it from its widest part to the rear through an angle equivalent to an angle at which the plane is going to fly.

In making the deep-cambered wing to fly at a steep angle, one can see we get a heavier lift, since a great deal of air is distributed by the plane's travel. The air curves around the blunt front nose of the plane and forms a vacuum above as well as a pressure beneath. It is a peculiar fact that in the heavy-lift type curve, the major portion of the lift is given by the vacuum above the top surface rather than by pressure below the bottom surface as shown in Figure 5. Figure 6 shows the disadvantage of this wing at speed.

When this wing is attacking the air at a steep angle as in Figure 5, the air flow is fairly continuous over the top and bottom surfaces. When this wing is gotten up to speed, however, the blunt front edge builds up a bank of air in much the same way that a canal boat builds up a wave in front of itself when you try to force it at a higher rate of travel than that for which it was designed. Of course, in the air wing there is far less resistance than with a boat outline. Nevertheless, it is there and very noticeable at high speed.

FIG. 4

SIMILARITY OF WING AND SPEED BOAT LINES.

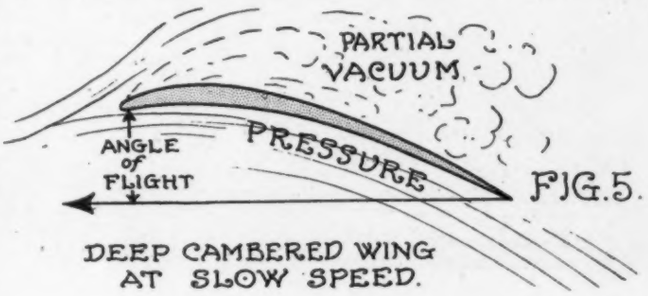


FIG. 5.

DEEP CAMBERED WING AT SLOW SPEED.

Working on the frames of a war plane wing. Note the great strength which it is necessary to give to the wing

At the right: The business-end of a plane and a glimpse of its power plant

Figure 6 shows this detriment for high-speed work.

A more modern type speed curve, a wing having less of a blunt contour at the front edge, can travel at flatter angles of flight without building up bow wave of obstruction. This curve, as you will notice, is very much like the waterline curve of a speed boat would be, had it been in a collision and been evenly bent around its axis fore and aft through an angle equal to a flying angle of the wing as in Figure 4. The lift per square foot in this wing, however, is very much less than in the wing curve shown in Figure 6 so that we again have the analogy found in watercraft, that if one designs for speed, he sacrifices tonnage capacity, and if one builds for maximum weight carrying, he sacrifices maximum speed.

Figure 7 explains the flying terms in relation to a wing curve. The pressure upwards on the wing as it travels forward at speed is known as the lift. The pressure which is required to shove the wing through the air at speed which would give this lift is known as drift or drag. Drift therefore, is that resistance which must be overcome in forcing a wing forward in order that lift may be produced. It is the ratio of lift to drift which tells the whole story of wing efficiency.

If one gets 2 pounds of lift for 1 pound of drift, he is more than breaking even with the horsepower consumed, but with modern wing curves one can get a lift of as high as 20 pounds from the wing for every pound that is spent in driving the wing forward.

This high lift, however, varies in the same wing with different angles. One wing may have great lift at a steep angle and is, therefore, only good for canal-boat types of airplanes where carrying capacity is the major requirement. Other wings have the best lift-drift ratio at between 1 and 3 degrees. These wings are, therefore, more suitable for speed machines. Before designing an airplane, the engineer selects the wing curve according to known facts concerning the characteristics of that curve. These facts are found out in wind tunnel tests on small models of these curves from which tests the engineer knows the lift-to-drift ratio at all angles of flying, the location of the center of lift or pressure on the

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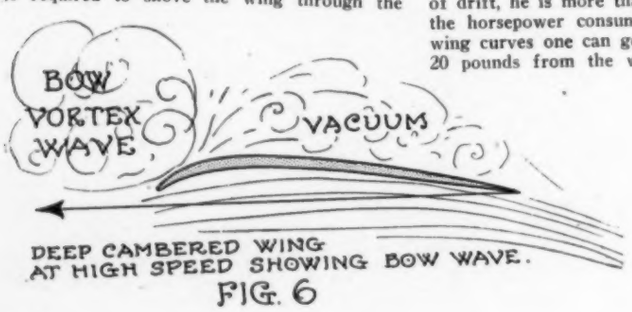


DEEP CAMBERED WING AT HIGH SPEED SHOWING BOW WAVE.

FIG. 6

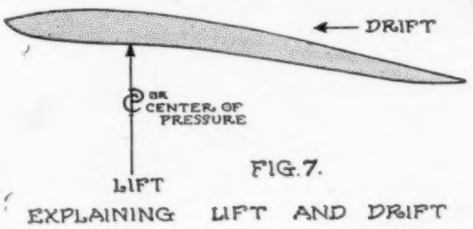
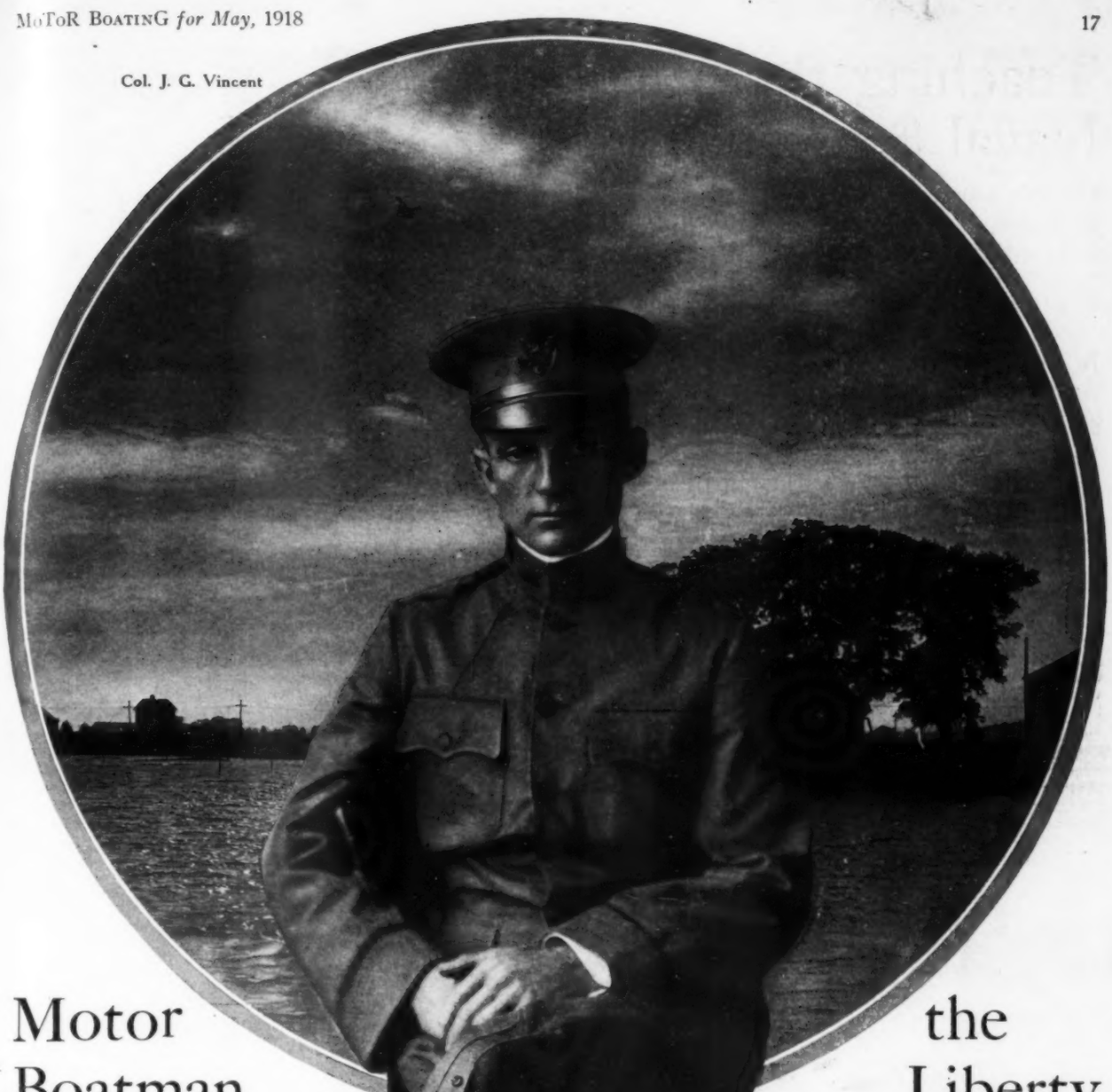


FIG. 7.

EXPLAINING LIFT AND DRIFT



Col. J. G. Vincent

Motor Boatman *Designs* the Liberty *Motor*

THIS story is about a man who bought a speed boat and left it to rust. It is about a man who was a tool-maker; who became a chief engineer, a vice-president of Packard, and then a Major after he had designed the Liberty engine and proved that it was a real, regular, he engine—which it is.

This story is about the man, too, who is now in charge of all airplane engineering for the U. S. A. and which hasn't swelled his head a bit, even if he is a Colonel and a lot of other things.

Lest you think we are starting to tell a lot of things about a lot of men, it is well to explain that this is all about one man—Col. J. G. Vincent—and one of the most prominent, if not the most prominent engineer before America's eyes to-day.

About a year ago, you will no doubt remember, there was no war in America. We were all reading about one a long way off, and Packard was using its vice-president of engineering to develop an airplane engine. Having such an engine at hand, this vice-president decided to buy a speed boat and try it out. He bought the boat—a fast one, too—and then couldn't get his own engine, because the Government was too much interested in them, and had to buy an ordinary one. He bought it and hired a fine boat-house, and painted it all up and ran his brand new boat into it, and said to his friends: "Now I'll call you up some day and we'll go for a ride."

I was one of them, and I haven't had the ride; for about the next day a wire came from Washington, and off went the vice-president, and the war was on and the vice-president became a Major and a Colonel and everything, and the speed boat is still there and the new paint is old, and the friends are waiting for a ride and he won't even let them go up in an airplane, just because he's busy winning the war. His boat has taken wings in more senses than one, and he can't design cars any more any more than he can fly.

He has never been able to take his speed boat away from land, but since his hobbies have wings his trouble is to get back to land. He is a real regular flier, but when he nears the shore with his airplane he can't use a reverse, and it takes time to learn how far the dock is away when you can't see it. He could have made better landings with his speed boat than he does with his airplane had he ever landed his speed boat; but if he had landed his speed boat the way he lands his winged yacht there would have been no dock to land his speed boat had there been anything

(*Continued on page 92*)

Teaching the Yachtsmen Naval Seamanship

Methods Adopted by One Organization to Keep Up Interest in the Club and Prepare Their Members for Government Service

By F. C. Scofield

Photographs by Rosenfeld

NATURE has been generous to the boating fraternity of this country in her provision of waterways, reaching so many of the beauty spots of this vast land; and the ever increasing number who take advantage of these waterways will assure you that the pleasure of boating is far ahead of any other of the present day sports.

But as we look around us we find great steam passenger and freight vessels plying these same waters upon their daily routes carrying on their part of the world's traffic, and the simple fact of their being there proves to us that some one has employed the body and brains God has given him, in study, for only great energy and deep thought has made possible these great steamship lines.

Granting that this is true, does it not follow that if the motor boatman desires to take advantage of these pleasures laid so temptingly before him that he is morally obligated to do his part to the end that the dangers to life and property should be reduced to a minimum, in the participation of his sport?

Our Government very wisely provides punishment for those who do not take the more simple precautions for their own and their guests' safety, also it compels the men operating commercial boats to prove their ability to do so before it permits them to assume the responsibility of such a boat, yet in less time than it would take to tell it, ignorance on the part of a small boatman, such as a lack of knowledge of whistle signals, etc., will upset the best calculations of an experienced pilot and cause a disaster.

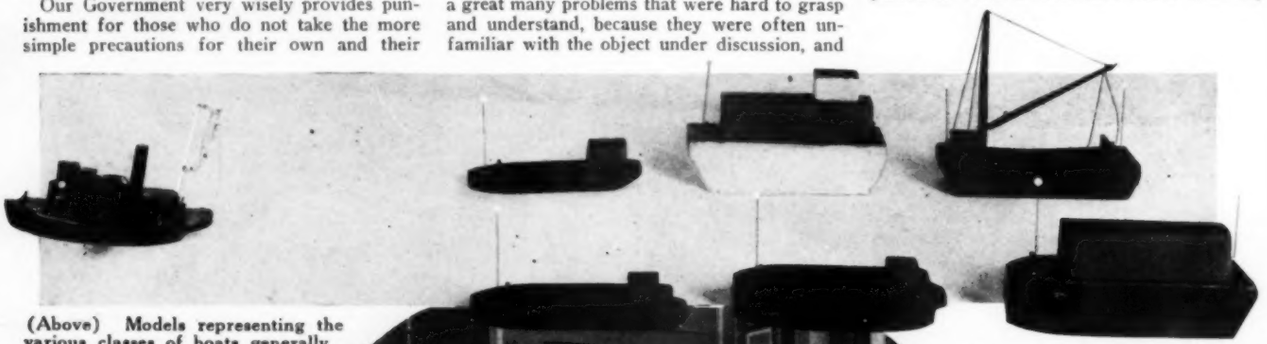
These facts, coupled with the approval of steamboat men and our Government, not only furnishes reason for but makes necessary such an organization as the United States Power Squadrons, Inc., and in order that the reader may understand just what this organization is doing for the small boatman through its instruction courses, I am going to describe the method adopted by one of the units of the United States Power Squadrons.

When the men who now compose this unit first started to prepare themselves for their examination (a most important requirement for membership in the U.S.P.S.) they found a great many problems that were hard to grasp and understand, because they were often unfamiliar with the object under discussion, and as each course was completed there were always suggestions that would help the next man over the same difficulty more easily, and at that time we found that the most important factor in the instruction of the class was the illustrated work done on the blackboard and drawings submitted to us by our instructor to illustrate the point that he was at that time discussing.

At any rate a sufficient number of our men passed to form a local unit which was duly organized and proper officers elected, and the first duty assigned to this body was the instruction of a new class, which, while it might at first seem to be a little premature, was the best thing that has ever happened to our unit, for it is in this work that you first really learn how little you know yourself.

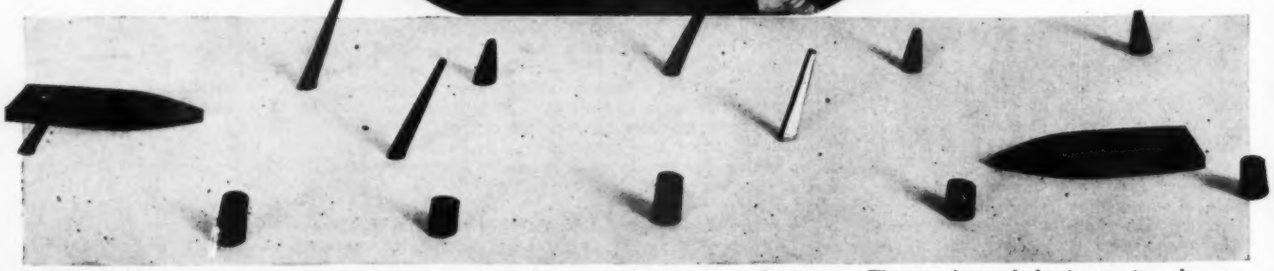
Several men were selected by the Commander to have charge with him of the instruction, and many

Some of the instruments used for class instruction. Most of them home made

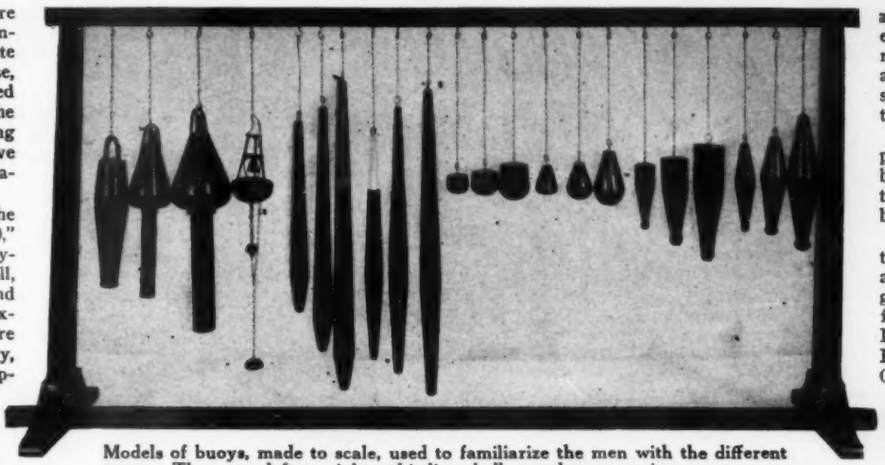


(Above) Models representing the various classes of boats generally found in Hudson River tows

(Center) A class in navigation at the Free Nautical School, run by the Hudson River Power Squadron



Models of buoys arranged on a table to represent conditions as they exist on the water. The members of the instruction class are required to navigate the model boats safely through the most intricate waterways



Models of buoys, made to scale, used to familiarize the men with the different types. They are, left to right, whistling, bell, wooden spars, iron spars, can, nun, and tall can and channel buoys

novel ways were thought out and employed to illustrate our work; of course, not all were adopted at one time, but the description following shows what we have in the way of paraphernalia to date.

First we have the "N. P. S. No. 20," the flagship, twenty-four inches over all, eight-inch beam, and powered with a six-volt forty ampere hour storage battery, and complete equipment including two mahogany tenders.

This model cruiser is used by the squadron for instruction on the lights and the rules of the road, the lighting outfit is complete to the minutest detail, and is controlled from a switchboard which can be located at any point not to exceed nine feet from the boat itself; from this board it is possible to control any single light or any combination of lights necessary to illustrate a motor boat or steamer, so that when a student is told the combination to be used on a motor boat of class one, two or three, he is also shown that combination of lights, so that he forms a picture in his mind more lasting than memorizing could possibly be; tugs, towing on "long or short hawser," towing alongside or running light, all show different combinations which are made on the model; also the anchor lights, according to the length of the boat.

Another particular value of this model boat is that the student has the opportunity to view these various combinations from the several angles possible in actual practice, and thus learns to determine the position of another boat, according to the visibilty of its lights.

When explaining the rules of the road, the two small mahogany boats, with the running lights painted on their decks, are used to manouver in conjunction with the flagship, a student operating these smaller models and announcing the proper signals as the boats are moved from one position to another.

Our cruiser also has a rudder, or, to be exact, a rudder post, with a wheel on the under water side, and by turning this, as you would aboard boat, you can push the model along and it will respond in the same manner as though it was in the water. For instruction work on the use of the rudder, this is very valuable; this rudder may also be operated from a wheel located on the bulkhead of the forward cabin, the type of the model being a bridge-deck cruiser—the lights are all properly screened and the bridge, after cabin and cockpit are covered with an awning, supported on heavy copper wire frame with battens lashed on.

Located just in front of the steering wheel, and flush with the forward deck, is a compass about one-half inch in diameter, which moves as the position of the boat is changed and illustrates the action of a compass under actual conditions.

We have recently added another boat to our fleet, a raised-deck cruiser about three feet long with a nine-inch beam; this will be similarly equipped as the flagship and used in conjunction with it.

Inasmuch as these boats are equipped with bow staff, stern staff and signal mast, it is also possible to illustrate flag etiquette with them.

An oblong board built on an angle of about sixty degrees so as to lean away from the observer, painted black and equipped with eighteen small bulbs properly colored and so wired as to permit of their being lighted singly or in combination and controlled from a switchboard similar to the one used on the cruiser, is placed in a darkened room and various combinations lighted to show boats on different courses, boats at anchor, pilot boat on station, fishing boats, dredges, etc. The appearance to the student is very real and is of great help in memorizing the lights which we cannot show on the model boat.

Having arrived at this stage it becomes necessary to take up the compass before going further, as a knowledge of the compass is essential to most of the work that follows, and in this we use a regular liquid compass and a drawing specially made by our Commander.

With this drawing the various points are marked so as to show their relation one to the other; arrows guide you at every step, and, in fact, the compass is simplified to such an extent that we have seen classes of twenty-five learn to box the compass in one evening who had had no previous study of it.

Cardinal points are all marked alike with a solid triangle, inter-cardinal points with a triangle of the same size, except that, because it is a lesser point, the center of the triangle is removed; sub-cardinal (not usually so called) are two triangle bases together and the center removed, because they are a combination of the cardinal and inter-cardinal points; by-points are marked with a small solid triangle, arrows indicating how each point should be read, each quadrant, and how the reading should be for the entire compass.

Copies of this compass as described are blue-printed and distributed to each member of the class.

Then comes deviation and variation, and here we find a great deal of help from our text-book, Practical Motor Boat Handling, by C. F. Chapman; also here we find use for the liquid compass, for, by setting our compass on the table in front of the class and adding and subtracting different metallic substances, we show the effects produced and what does and what does not affect the compass.

Enlarged drawings, copied from Practical Motor Boat Handling, of a boat with a compass attracted by the engine on different courses also help in this work.

For demonstrating variation, we have a rattan circle with a fixed magnet in its circumference located a short distance from a point on the circumference marked true north.

By calling the magnet magnetic north and placing the circle around a small compass, it is very easy to get the student to grasp the idea of variation.

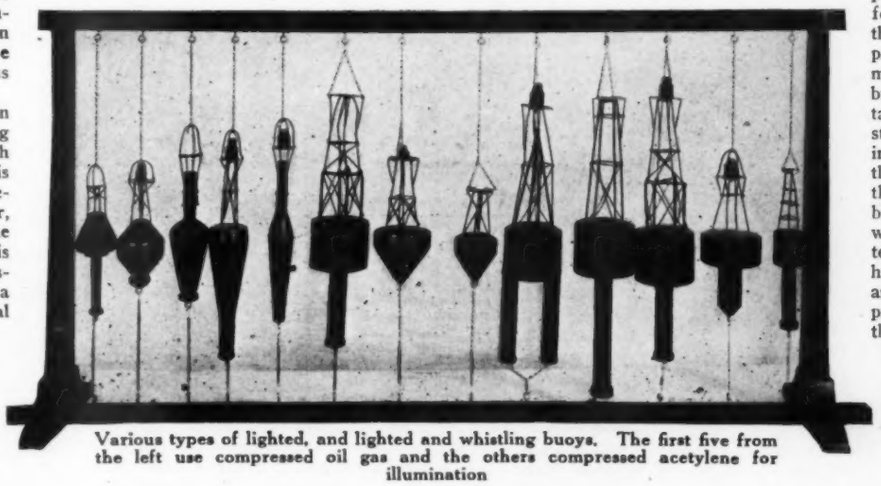
Through the courtesy of the Hon. Franklin D. Roosevelt, Assistant Secretary of the Navy, we have been very generously supplied with charts of various localities, and our chart work is done on these, working out actual courses with the aid of coarse protractor parallel rules, pelorus, etc.

One of the instruments used aboard a boat, and which it is necessary to have a fair knowledge of, is a bearing finder or, as it is called, a pelorus.

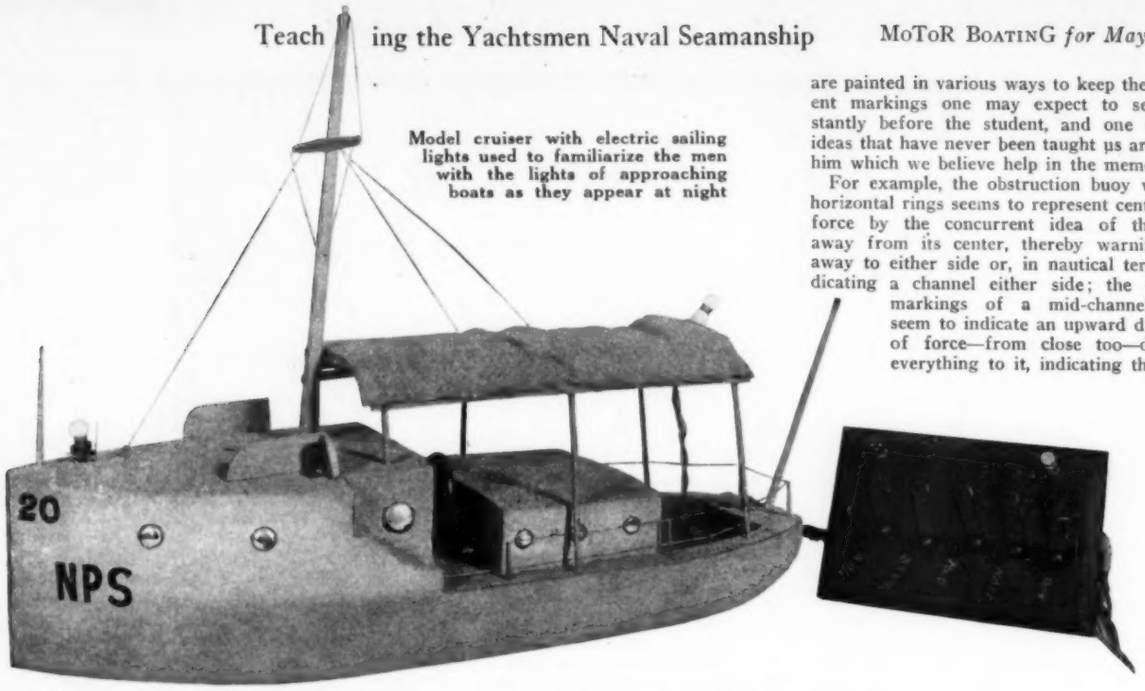
The job of constructing an instrument of this type was delegated to our Squadron Secretary, and the result was extremely satisfactory, so that our classes are now able to acquaint themselves with the actual use of this instrument.

The various instruments used in laying a course, such as those already mentioned, are available for our class work, and when with the aid of them the student has plotted his course and secured his sailing data, we ask him to show us how he would travel that course depending solely on the chart markings and aids to navigation he would find en-route; and in order to make this plain we trace the course on a large blank piece of paper and place the markings found on the chart on the blank piece of paper, not in colored marks with a crayon, but with miniature table buoys, so constructed that they will indicate the flow of the tide or current by their slant. These buoys range all the way from three-quarters of an inch in height to three inches and are properly painted to represent the various types; the ends are cut obliquely and, where necessary, weighted to make them stand up.

In this collection there are spar



Various types of lighted, and lighted and whistling buoys. The first five from the left use compressed oil gas and the others compressed acetylene for illumination



Model cruiser with electric sailing lights used to familiarize the men with the lights of approaching boats as they appear at night

buoys of both plain red and plain black, as well as the red and black horizontal striped buoy, indicating an obstruction; black and white vertical striped buoy indicating mid-channel; white, anchorage; and yellow quarantine buoys. The use of these in connection with our chart work has been extremely helpful, as it furnishes the necessary novelty to the work and at the same time teaches the prospective boatman to be particular in noting his markings on the chart; also it helps to familiarize him with the different styles of buoys. In this, however, he is more fully instructed, as you shall see later.

Tides and currents are taught under this heading and, in accordance with our policy of sight teaching, we illustrate with diagrams of problems that have been previously worked out; these are enlarged on heavy paper and are adaptable to class instruction.

In this connection the student is taught to appreciate what his Government is doing to aid in making navigation safe, and he realizes how seriously the Government takes this when he is shown copies of the Coast Pilot with its detailed information—the buoy lists and tide tables—all prepared and distributed by the Government with the utmost care and accuracy. All squadron men and students of this unit receive, and what is more important are taught to use, the publication known as Notice to Mariners, and from time to time the student is asked to demonstrate the correction of certain charts and light lists from a late copy.

The commercial boats that navigate the waterways, more especially the inland ones, are sometimes a little difficult to make clear to the layman, and in order to overcome this we have constructed a series of models that help him to memorize these and at the same time hold his attention.

First we have a small model of a tugboat, approximately three inches long, and by using pins with colored heads have equipped it with proper lights placed in the right position. The lights for the after mast, indicating the size of the tow, are soldered to a copper wire that fits on the mast and is readily removable, so that they can be changed at will. We also have two model coal barges as they appear when loaded, and one to represent one when being towed light; also an ice barge, an ordinary cargo barge, and a construction barge with the derrick placed thereon. The lights on these are properly indicated, as they are on the tug, by means of pins with colored heads; and by moving these models about on the table we can form the different combination of tows of the various classes, and the student gets the idea of how they would appear to him from the various angles of approaching and overtaking.

Then comes a class of commercial boat not so often seen, and therefore more particularly remembered because of the models representing its marks, such as self-propelled suction dredges, submarine construction boats, etc.

To demonstrate these various markings or day signals we have a staff about one-foot high mounted in a wood base and fitted with a wire hook at the top, to which we attach miniature balls and cones properly marked or colored to represent the day markings of the above-mentioned boats.

In order that the student may know the various types of buoys and what they look like both above and below the waterline, we have constructed in miniature a complete set as used by the lighthouse service, made to scale so as to obtain the right proportions.

This set includes the spar, nun and can buoys, both large and small, and the various classes of each; also bell buoy, whistlers and the entire set of lighted buoys with the complete superstructure mounted thereon. These are painted in various ways to keep the different markings one may expect to see constantly before the student, and one or two ideas that have never been taught us are given him which we believe help in the memorizing.

For example, the obstruction buoy with its horizontal rings seems to represent centrifugal force by the concurrent idea of throwing away from its center, thereby warning you away to either side or, in nautical terms, indicating a channel either side; the vertical markings of a mid-channel buoy seem to indicate an upward direction of force—from close too—drawing everything to it, indicating that it is to be passed close by; the yellow is universal for quarantine and the white represents repose or anchorage.

Whether or not these thoughts were in the minds of the designers when the markings were originally chosen we do not know; they are simply means we have found of making it easy for the landsman to couple it with something in his mind that has a familiar tang to it.

These buoys are arranged so that they are hung in a frame purposely constructed for them and are not taken down at all, being for observation only, which explains our reason for the additional table buoys.

We also have a miniature lighthouse with a fixed light, about thirty inches high over all, and lit from a dry cell contained in the lighthouse; this may be made either red or white by the changing of the lens.

Next comes a part of our work not so essential to simple navigation as the rest, but a real necessity to the man who would succeed in our governments service—this is signalling.

For this we have, first, a complete set of international code flags, particularly made for small boat work and in a container that is the only real practical one ever seen by the writer for all classes of small boats. From a hoist in the ceiling different signals are made with these, the classes being taught their meaning and their method of use. Next comes the wig wag, with an instructor at each end of the room sending signals to each other and the class making notes of the mess-

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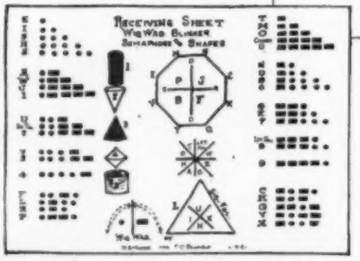
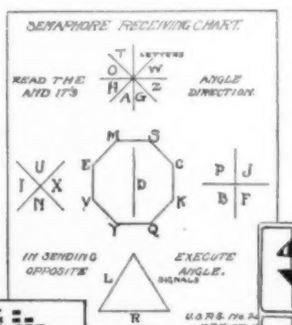
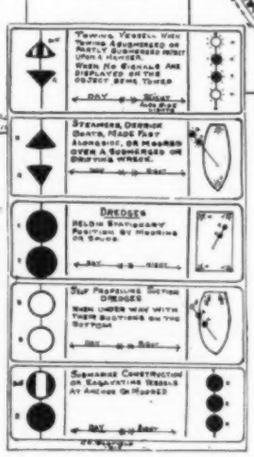
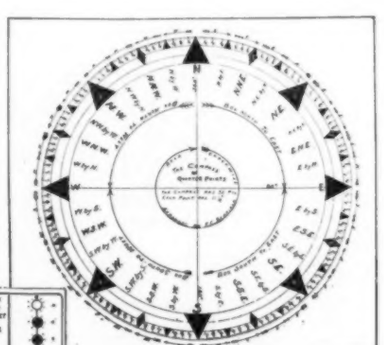


Receiving sheet with dots and dashes arranged for receiving blinker-light signals





(Above) An original method of teaching the semaphore system of signaling. (At right)—Card showing the day and night signals carried by vessels not often encountered by the average motor boatman



Compass card arranged for beginners

Building a War Time Knockabout

A 20-Footer for General Use That Combines the Good Points of the Dory and V-Bottom and is Easier to Build Than Either

PART I

WHEN working up the design of this little craft the intention was to produce a capable, seaworthy boat, able to stand its share—and more—of bad weather, and at the same time to be an easy and inexpensive boat to build and maintain. A glance at the plans will show the flat dory keel, which does away with much of the framing and fitting necessary when the conventional keel timber is used and the difficult operation of cutting a rabbet in the keel. Above the keel plank the lines are very similar to the V-bottom model.

To simplify the construction the bottom planks are put on vertically, from keel to chine, thus doing away with the use of frames, and making the planking much easier to fit. This method of planking the bottom also eliminates the necessity of cutting a rabbet in the chine, as is necessary in the true V-bottom type.

The motor is installed way aft, as is usual in dories, leaving a large cockpit free from all obstructions. Following the general dory practice the engine compartment is separated from the cockpit by a bulkhead with a removable section and is decked over. A sliding hatch is provided over the motor of sufficient size to give free access for making the necessary adjustments and repairs. The motor controls should be lead to the front of the bulkhead so that it will be unnecessary to uncover the engine in rough or rainy weather to regulate its operation.

In selecting a motor for this boat it should be kept in mind that the maximum economical speed of this model of hull is about 8½ m.p.h. and this speed will be obtained with a motor developing 4½ to 5 h.p. at 500 r.p.m. Increasing the power above this point will produce very little in the way of additional speed. The motor shown in the drawings is a 4 h.p. two-cycle engine. If a reverse gear is to be used, the motor should be set a little farther forward, and the bulkhead built accordingly.

When it comes to finishing the decks, we will admit that painted canvas does not make as good an appearance as varnish, but when a boat with a varnished deck is exposed alternately to sun and rain or spray, the deck will be about as tight as a sieve. Much better satisfaction is always had from canvassed decks. The engine compartment is fitted with a shelf on either side for tools, batteries, oil cans, etc., and a water-tight canvas deck will be a great help in keeping the batteries dry and preventing the tools from rusting.

When building a boat a tight shed will be a great aid in protecting the work from the weather and will help in securing a smooth well-finished job. The lumber should be kept dry, as the finished work if exposed to the weather will warp and go to pieces in a remarkably short time.

Although you do not realize it at the time, your anxiety to finish the work will edge you on to slight the little things. Don't do it. You will be sorry for it as long as you have the boat. The only way to build a boat and have it look good—and be good—is to go slowly and carefully without slighting any detail no matter how insignificant it might appear at the time.

In the way of tools, all that will be necessary is an ordinary carpenter's outfit supplemented with a half dozen 6-inch boat clamps and a chain clamp for planking. The clamps will be worth many times their cost in holding the pieces in place until they are fastened, and the chain clamp will assure close seams in the planking. If you have not a complete set of tools it is just as satisfactory and much more economical to buy them as they are needed. In this way you will not have a supply of unnecessary tools when the work is completed. One thing necessary is a good oil stone, for the best mechanics cannot do good work with dull tools. Just one thing more in regard to tools—cheap tools cannot be kept sharp and in good working order and are more trouble than the difference in cost merits.

The boat described in this article is a compromise between the dory and the V-bottom types and combines the good points of both in a model which is easier to build than either. As its name implies, it is a boat which can be used for many purposes. It is more stable than a true dory model and just as seaworthy, while at the same time it can be driven at moderate speeds as easily as a V-bottom boat of the same size. It is a type we can recommend to the man who wants a real boat for all-around service.—Editor.

When fitting up a work bench, remember that it must be firm and rigid if you expect to do any accurate work on it. A bench vise will be necessary and is inexpensive. If you have no floor to set the frame up on or an uneven floor, procure three pieces of heavy timber just a little longer than the boat, the size and quality of which is not of much importance so long as they can be leveled up straight and solid to set the moulds on. Have the foundation secure and level and it will save a lot of trouble later on truing up the moulds.

The first thing to be done after the lumber has been delivered will be to take the two pieces of oak that are to be used for the chines and spring them into the curve they will assume in the finished boat. They probably will be too stiff to be bent into this shape at once, but by springing them a little more every day you will finally have them bent to the proper curve. The most convenient place to do this will be on the floor, using blocks nailed fast to hold the chines in position. This may seem to be a lot of unnecessary work but when you try to put them in place you will find that you are well repaid for your trouble.

Getting Out the Moulds

The first actual work in building a boat is to get out the moulds. These can be made of most any sort of stock about ⅞ inch thick, constructing them as shown in Fig. 1, being careful that the center line is marked on both top and bottom members. Care should be taken that the moulds are exactly symmetrical and that the corners are securely fastened so that they will not get out of shape.

Care must be taken in cutting the notches for the sheer clamps and chines so that they will hold the pieces accurately in place. The notches for the sheer clamps are to be cut 1⅝ inches deep and those for the chines 1½ inches deep. The notches for the sheer clamps are 3½ inches wide throughout, but the notches for the chines vary at each mould as shown in Fig. 1. The tops of the moulds are carried above the sheer line so that when they are inverted and nailed to the floor they will need no blocking to bring them to the proper level relative to each other, and as it is much easier to work on the hull when it is inverted, it should be built in this position.

The Transom, Keel Plank, Stem and Deadwood

The first piece of the boat proper to be got out is the transom (Fig. 1). This should be either oak or mahogany. If oak is used it probably will be necessary to make it in two pieces fastened together with a 1 by 2-inch oak batten screwed onto the two pieces. Mahogany can be secured in one piece and will cost very little more than oak. Whichever wood is used it should be 1⅛ inches thick and free from all knots or checks. The frame shown on top of the transom is only a temporary arrangement to hold it in position when setting up the frame. The curve at the top is laid off with a radius of 8 feet 6 inches.

After the moulds and transom are completed, the next piece to be made is the keel plank. This should be of oak, elm or mahogany and it will save some work if it can be secured in a single width. If either oak or elm is used it most likely will be necessary to make it of two pieces. In this case the two pieces should be securely fastened together with oak cleats on the inside, spaced not more than 18 inches center to center.

When laying out the keel plank from the offsets given in Fig. 1 to the inside and outside edges, it will be much easier to get a smooth curve if brads are driven in at the points given on the curve and a batten is sprung along the line of brads and the curve marked off along the edge of the batten. The line of the inside edge is laid off on one side of the plank and the outside edge on the other side. Almost any small strip of wood that is a little longer than the keel may be used for a batten provided it is free from knots and of fairly even grain throughout so that when bent it will assume an even curve.

The stem is to be made from 2¼-inch oak, scarfed as shown, or a hackmatack knee, if one can be procured. You will be saved from much hard work if you have the stem cut out on a band saw at the mill. The outline of the stem should be laid off according to the offsets from the two base lines as shown in Fig. 3. It will be better to use a very thin batten when marking off the stem in the same manner as when laying off the keel plank. Lay off the rabbet line on both sides of the stem.

If the stem is made in two pieces, fasten them together with a ⅜-inch galvanized bolt

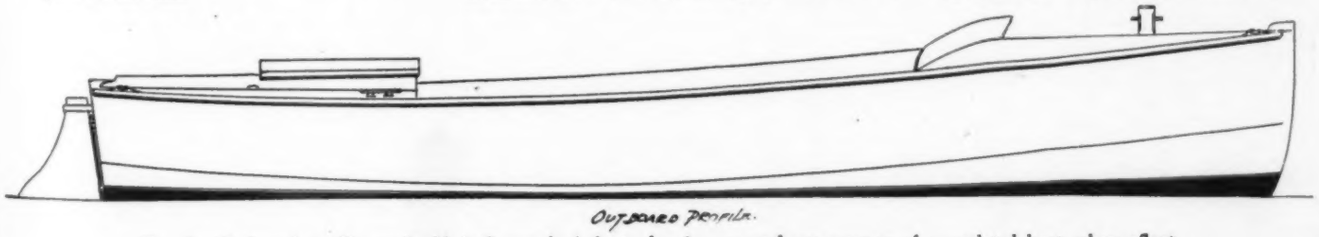


Fig. 2—Outboard profile, scale ⅜ inch equals 1 foot, showing general appearance of completed boat when afloat

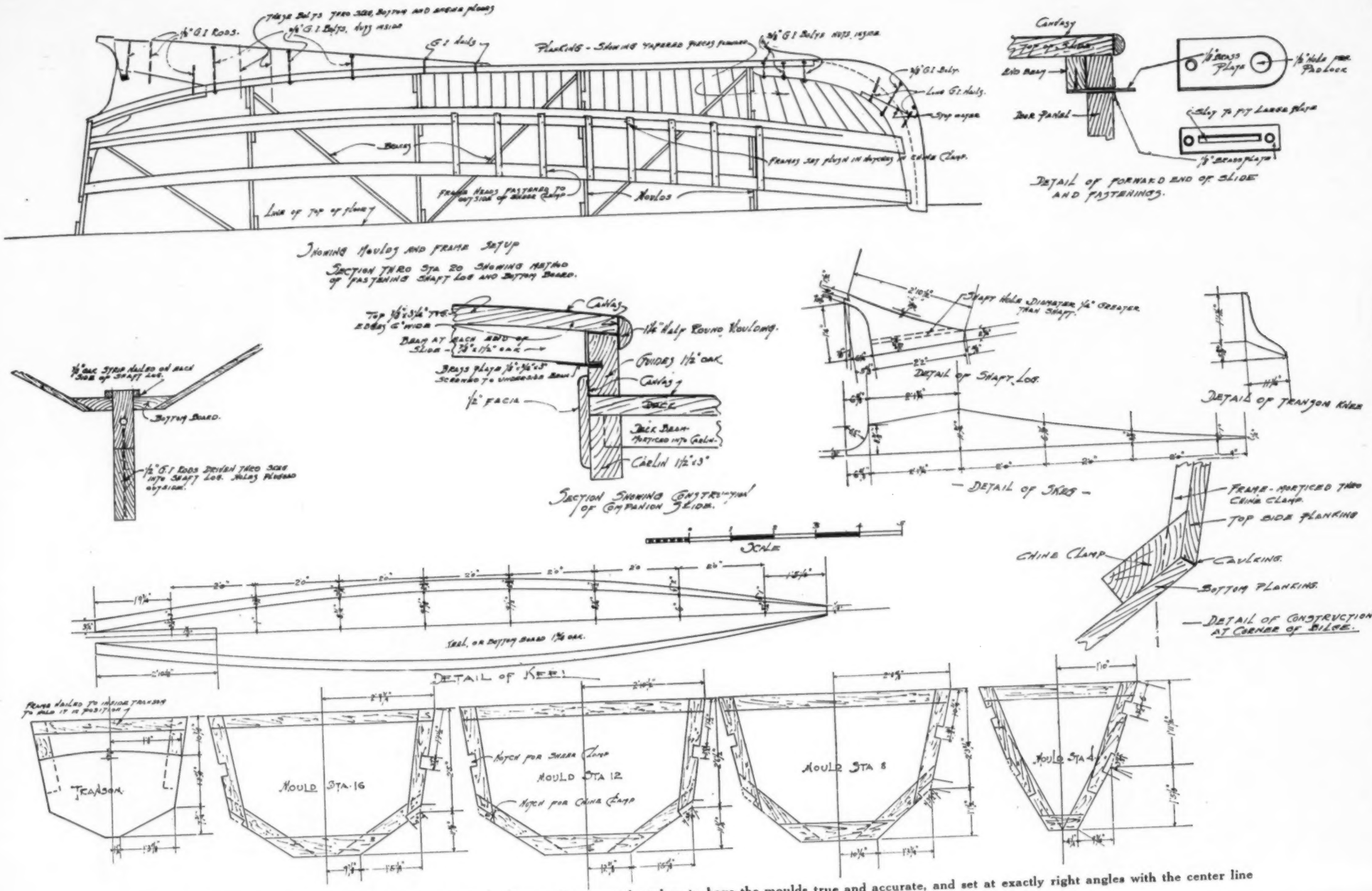

Showing Moulds and Frame Set up
Section thru Sta 20 Showing Method of Fastening Shaft Log and Bottom Board.
Section Showing Construction of Companion Slide.
Detail of Forward End of Slide and Fastenings.
Detail of Shaft Log.
Detail of Skeg
Detail of Transom Knee
Detail of Construction at Corner of Bilge.
Detail of Keel
Transom.
Mould Sta 16
Mould Sta 12
Mould Sta 8
Mould Sta 4
Scale

Fig. 1—Construction details and method of setting up the frame. Care must be taken to have the moulds true and accurate, and set at exactly right angles with the center line

and two galvanized spikes as shown in Fig. 1. The bolt head and spike driven from the outside should be deeply countersunk and the holes carefully plugged with wood. The stopwater, a small pine plug, should be put through the stem just inside the rabbet line.

Holes should be bored for all bolt, spike and dowel fastenings to avoid the danger of splitting the wood. The holes should be bored with a bit 1/16 inch smaller than the fastening so that they will have a good grip on the wood and at the same time be water-tight.

Unless you have had previous experience along this line, do not try to cut the rabbet in the stem until you are ready for the planking, and then only for one plank at a time. For the amateur this is probably the most difficult part of the entire job, and once a mistake is made the only really satisfactory remedy is a new stem.

The keel or skeg and shaftlog are to be worked out of 3-inch oak planks. The dimensions and offsets are given in Fig. 1. When getting out these pieces, great care must be taken to get the edges perfectly smooth and square. Use a small try-square on them often and be sure of a neat, tight joint. If the edges are rounded or are not square, the fastenings cannot hold the pieces together as securely as they should and will allow the bolts and fastenings to bend in case of heavy strain.

Before boring the hole for the shaft through the shaftlog it will be well to settle definitely what make and size motor is to be installed. Then lay out to scale on paper the shaftlog, skeg, keel plank, engine bed, and centerline of shaft and see that the shaft hole as shown in Fig. 1 will fit the particular motor to be installed. This diagram will also be useful to get the approximate size and shape of the engine bed timbers. After the shaft hole has been checked by the centerline on the diagram, it is laid off on the shaftlog.

When it comes to boring for the shaft, the most satisfactory method of guiding the auger is to nail a straight piece of ⅞ by 4-inch board about 4 or 5 feet long on each side of the shaftlog with the tops of the strips exactly on the centerline of the shaft. Cut a block the same width as the thickness of the shaftlog and nail the free ends of the strips to it so that the block is perpendicular to the shaft. Bore a hole through the block the size of the auger to be used and so located that the center of the hole is on the centerline of the shaft. This hole will then act as a guide for the auger when boring for the shaft.

The auger used should be about ¼ inch larger in diameter than the shaft to be used and be what is known as a flat-foot auger, or one without the spur at the center. This will require greater pressure to bite into the wood, but a spur always tends to follow the grain of the wood and leads the auger off the intended line. Probably it will be better to bore the hole from both ends to meet at the center, as by this scheme it can be located accurately at each end, and by using the guide and working with care the two holes will meet exactly. The hole should be started with an ordinary brace and bit as a flat-foot auger has nothing to keep it in place until the hole is well started.

There is but one more piece to be got out before setting up the frame. Cut the transom knee from 1½-inch oak plank according to the dimensions shown in Fig. 1, being careful to get the edges true and square.

Setting Up the Frame

With a chalk line mark off on the floor or foundation timber the centerline of the boat. Mark a point for the bow and at intervals of exactly 4 feet, draw lines at right angles to the centerline. These lines will be known as stations 4, 8, 12 and 16.

Now set up the moulds, fastening them securely in place, centering them accurately over the chalk line on the floor. Moulds 4 and 8 are to be set with their forward edges on the station lines and moulds 12 and 16 so that the after edges are on the station lines. Plumb the moulds carefully and brace them securely as shown in Fig. 1.

Bolt the keel plank to the stem, counter-

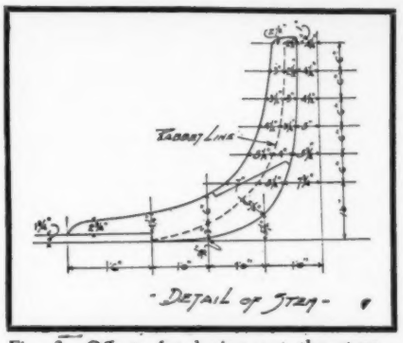


Fig. 3—Offsets for laying out the stem

sinking the bolt heads about ½ inch into the plank and covering with wood plugs. Lay the keel plank in position over the moulds, being careful to have the centerline on the keel plank come over the centerline marks on the moulds. When in its proper position fasten the stem securely to the floor.

The keel can now be bent down over the moulds, taking care that its centerline coincides with the center of the moulds. The after end is best held down by braces from the ceiling.

The shaftlog slips through the slot in the after end of the keel plank and is held in place by the ⅞-inch square strips of oak which are nailed securely to both pieces.

After the shaftlog is in place the transom knee is fastened to it with long galvanized iron screws. The transom is then fastened to the knee with brass screws. The screw holes should be counterbored to a depth of about ⅜ inch with a ½-inch bit and the holes filled with wooden plugs after the screws are driven.

You are now ready to put on the skeg. This piece is bolted to the keel plank and fastened to the shaftlog with ½-inch round galvanized iron rods. The bolt heads should be countersunk and the holes plugged. When boring for the iron rods do not let the bit enter the shaft hole, and be sure the rods are the proper length before driving them home. The outer ends of the rods should be driven in a little below the surface and the holes plugged. If the keel plank is in two pieces the bolts should be staggered, that is, placed alternately off the centerline so that some of them will be in each plank.

The sheer clamps can now be put in. They are to be ⅞-by 3½-inch yellow pine, and must be securely fastened to the stem ½-inch below the deck line. It is well to fit the forward ends first, spring them into the notches in the moulds, and then cut the after ends so that they will make a neat fit against the transom. They are securely fastened to the transom by means of knees cut from 1⅛-inch oak and are tacked to each mould.

If you bevel the chines, it will be much easier to spring them into place. The bevel varies throughout but can be taken from the moulds and cut roughly to correspond. Fasten them securely to the transom, and tacking them to each mould, secure them to the stem, beveling the ends so that the forward edges strike the stem about 2 inches aft of the rabbet line. After they are in place plane the beveled edges to the exact angle of the sides.

When the chines are completed, lay off on them and the sheer clamp the spaces where the frames are to go. Commencing at the center, cut the notches in the chine by making two saw cuts and chiseling out between them to a depth of ¾ inch. Cut the notches carefully, so that they will be a snug fit for the ¾ by 1½-inch oak frames. The forward frames are not mortised entirely through the chines, from 2 to 2½ inches will be sufficient. The frames are 12 inches center to center, and fastened to the chine and sheer clamp by two galvanized nails at each end. The lower ends are cut off flush with the lower side of the chine.

The Planking

The most suitable material for planking the hull is cedar or cypress, ¾-inch thick, and of sufficient length to reach from the stem to transom without joints for the planking above the chine. Before attempting to cut any of the planks, divide the distance from the angle of the chine to the top of the sheer clamp into four equal spaces and mark them off on the stem, frames, and transom so that they can be seen from the inside of the boat and used for marking off the planking.

You are now ready to cut enough of the rabbet in the stem for the first plank above the chine. To get the proper angle for the rabbet, take a batten about ¾ by 2 inches and long enough to reach from the stem to the second mould, tack it to the moulds and cut the forward end at the rabbet line, making a square end.

With a chisel cut the rabbet so that the batten will fit in flush as it bends around the moulds, taking care that it lies flat against the stem for the full width of the rabbet. Cut the rabbet for one plank at a time, using a batten to get the angle. Great care must be taken in doing this part of the work or it will be impossible to make this joint water-tight.

Take the piece from which you are going to cut the first plank above the chine and cut the end to fit roughly into the rabbet. Clamp the plank in place and with a pencil run along the angle of the chine mark the lower edge. Mark the upper edge from the marks already on the frames. Take off the board and with the aid of a batten draw a line through the marks indicating the top of the plank.

The top edge is planed at a slight level so that the seam will be a little wider at the outside. The bottom edge is to be planed to make a mitre joint with the bottom planking as shown in Fig. 5, the angle being taken from each mould. Lay this finished plank on a board and cut another just like it for the other side, remembering that the edges are beveled in the opposite direction.

After the two planks have been cut and the edges beveled, clamp them in place and cut the ends to fit neatly into the rabbet.

You are now ready to fasten the plank in place. Use the clamps to hold the plank in position while putting in the fastenings. Starting at the bow, fasten it securely to the stem with three brass or galvanized screws. At each frame use three galvanized wire nails, one driven about ½-inch from each edge of the plank and one at the center. These nails should be long enough to project through the frames about ¼-inch after the heads have been punched. The points are turned over or clinched. Drive two nails through the plank into the chine between the frames and about ½-inch from the edge of the plank. These nails need not be clinched.

In getting out the next two planks, tack a ¾ by 2-inch batten along the moulds with the lower edge on the marks indicating the top of the next plank. Lay the piece from which the plank is to be cut over the plank already in place and the batten and with a pencil mark out the edges, using the batten and plank as guides. Saw out the plank and plane up the edges with a slight bevel as in the preceding one.

After the plank is planed up, cut the forward end to fit the rabbet and fasten in place with clamps. Use the chain clamp to pull the planks together. The planks should extend a little beyond the transom and be fastened to it with three screws in each plank. After all the planks are in place, the ends can be cut off flush with the transom.

The top edge of the sheer strake, or top plank, should not be planed off until the plank has been fastened in place. Do not be afraid to use the chain clamp. The inside edges of the seams should be tight, and the outside open just a little to receive the caulking. Don't be afraid of getting the planks too close, they will shrink some before the boat is completed and to have a tight boat the seams must be narrow.

The bottom planking comes next. This is put on from keel to chine and not fore and aft.

(To be continued)

What Has Been Accomplished

The Commercial Motor Boat for Special Purposes to Such an

II.—THE MOTOR

By A. V.

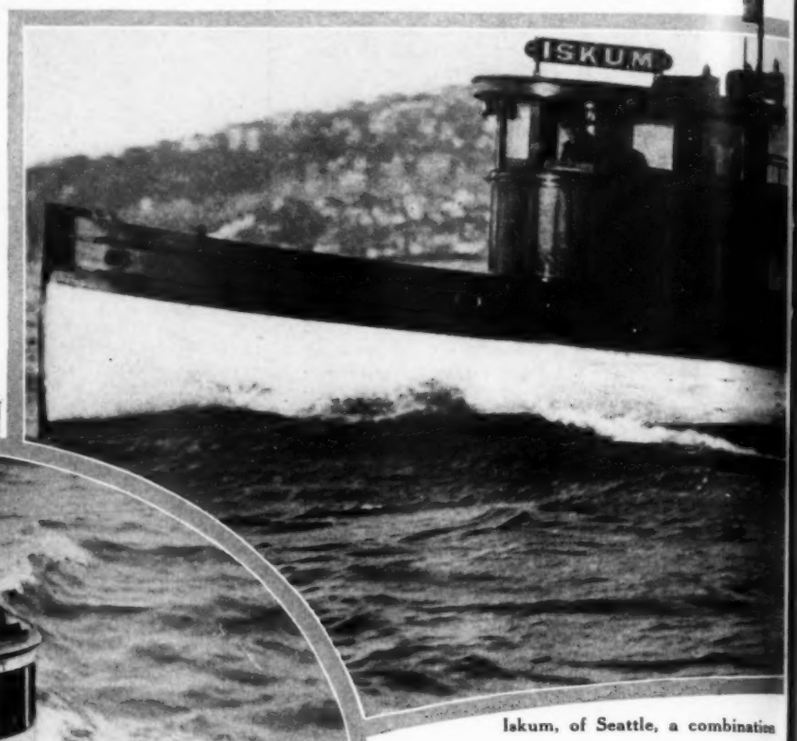
WHEN commercial motor boats of the Pacific Coast are mentioned the average man interested in the subject immediately calls to mind the immense fleet of motor fishing vessels that ply Pacific waters, north and south. In contemplating that tremendous fleet he is prone to overlook the fact that there are thousands of other commercial motor boats on the Pacific side of the continent engaged in all the ordinary pursuits of commerce and business that water-borne craft usually participate in. This fleet had its beginnings in the small, low powered craft of nondescript design and indifferent workmanship that appeared here and there up and down the coast a score or more of years ago, and it is doubtful if even the most sanguine prophet of those days could vision the fleet as it stands to-day, a myriad of motor craft so well designed, so well built, and so well engined that they serve as examples well worthy of imitation by designers and builders the world over. No progressive designer or builder of either commercial motor craft or heavy-duty motors in the whole United States is worthy of the name who has not watched carefully the development of this fleet, studied it carefully in the columns of his motor boat magazines, and profited thereby. I know that some eastern designers and builders of both engines and boats will not take kindly to this statement; nevertheless one has only to scan the pages of the motor boating magazines of the past decade to realize that what has been accomplished on the west coast has been a real factor in the development of commercial motor boating in the eastern field.

Roustabout, a powerful little 31-foot tug that is a one-man boat in every respect

I doubt if anywhere in the whole wide world is the commercial motor boat put to the diversity of uses it finds profitable on the sunset coast. Waterways everywhere, up and down the coast, lack of railway transportation in many out of the way places, and lack, even, in some parts of the coast region of good wagon roads, has made the motor boat the natural answer to the transportation problem. More than one business man who scoffed at the idea of using a motor craft profitably in earlier days now finds his business can not do without them, and there is not a square mile of water, coastal or inland, from Mexico to northernmost Alaska, that doesn't bear its quota of working craft powered with internal combustion motors.

One factor that I believe easterners particularly do not realize in its bearing on this subject, and that is that Pacific Coast waters from Mexico to Bering Sea are open to navigation the year 'round. Though New York and other eastern ports may be practically ice bound, as they were for a time this last winter, navigation goes merrily on in Pacific Coast waters of much higher latitude, and temperatures of ten or twelve below even as far south as St. Louis are often matched with temperatures of forty to fifty above as far north even as Ketchikan and Juneau. And Ketchikan is in the same latitude as the bleakest part of the coast of Labrador on the east side of the continent.

It would be impossible in the space of this short article to list all types of commercial motor boats in use on the Pacific Coast. By grouping the main types in this article, and describing typical exam-



Iskum, of Seattle, a combination

St. Marys, a 65-foot passenger boat used on St. on a lake, this boat has to contend with the severe tainous region. A fine example

In Commercial Boat Design

excursion and towboat

Has Nowhere Been Developed Extent as on the Pacific Coast

TUG BOAT

Comings

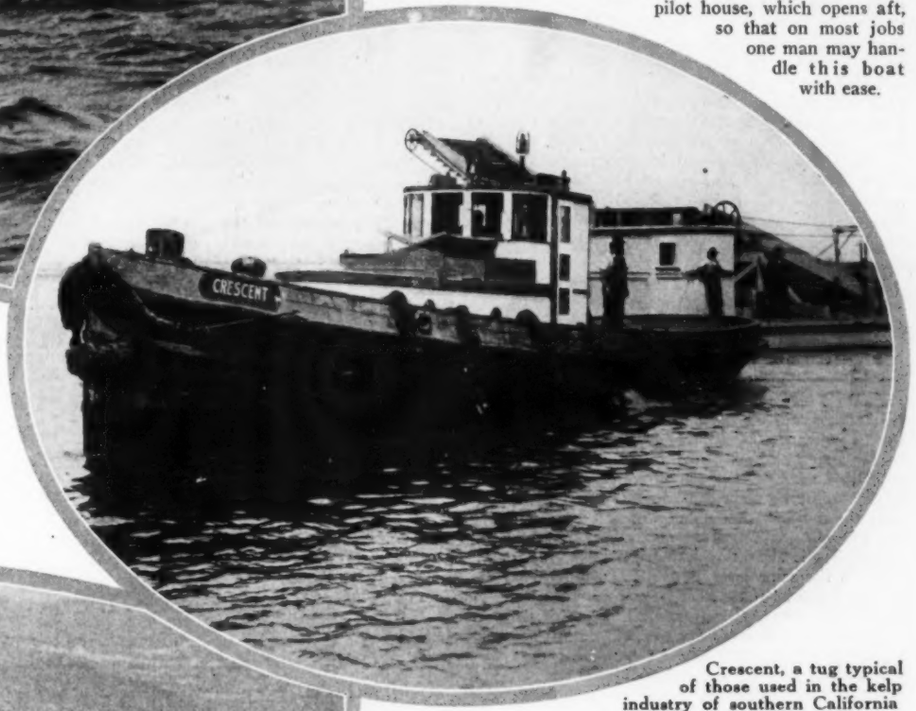
ples of each, I will endeavor to indicate clearly just what has been accomplished in the commercial motor boat field, and show why its fleet of commercial motor craft stands without a peer in the whole wide world. Consider the motor tug boat, for instance.

There are hundreds of this type of craft engaged in every conceivable kind of towing work all along the Pacific Coast, and every year has seen an advance in their size, in the efficiency of their design and construction and in the economy of their operation. The fact that a motor tug boat may be handled very easily by one man, or two at most, and that the moment the engine stops the fuel expense stops also, has been a potent factor in the adoption of this type of boat even by many steam tug companies.

The immense lumber industry of the Pacific northwest uses many motor tugs and some very fine examples of this type of boat will be found on the waters of Puget Sound and British Columbia, and on the Columbia River.

One of the largest of these tugs is the Kumtux, designed by L. H. Coolidge, a Seattle naval architect, for the owners, the Puget Sound Tug Boat Co. The tug is used for handling booms of logs, lumber schooners, etc., for the immense mills at Port Gamble and Port Ludlow and for work on Port Townsend Bay.

The Kumtux is 65 feet long, with beam of 16½ feet, and her power plant is a 110 h.p. Corliss motor, which gives her a speed of about 13 m.p.h., and great towing power. All engine controls are led to the pilot house, which opens aft, so that on most jobs one man may handle this boat with ease.



Crescent, a tug typical of those used in the kelp industry of southern California

The Kumtux not only has crews' quarters aboard her, but a 14-foot main cabin fitted up very luxuriously for the use of owners and their guests when necessary. She is of the raised-deck type now almost universal in Pacific northwest waters, with the pilot house placed about amidships. She carries 800 gallons of fuel, giving her a wide cruising radius.

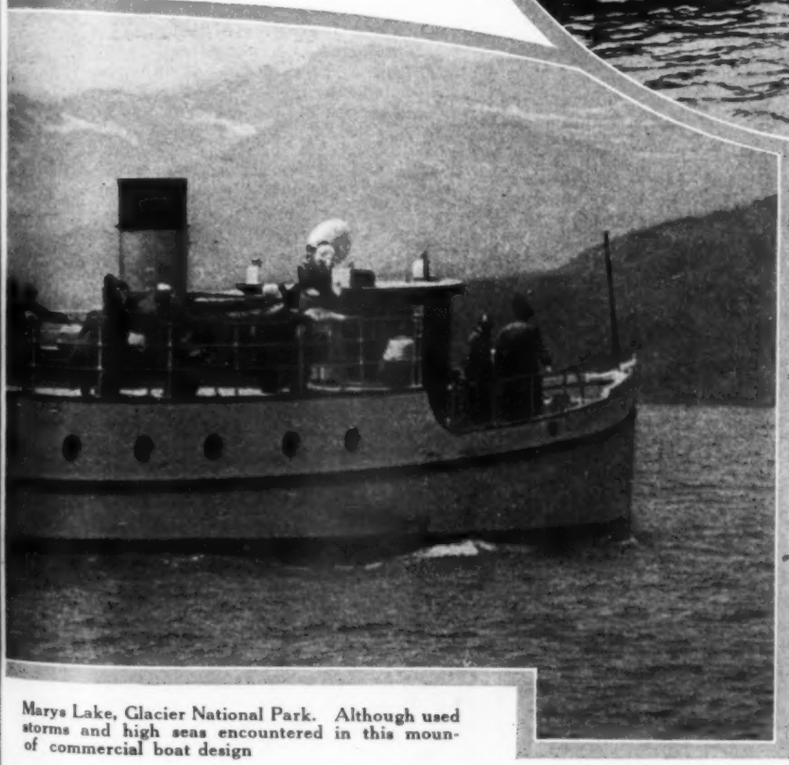
Another very interesting type of lumber tow boat is the Stimson, designed by L. H. Geary, for the Stimson Mill Co., of Seattle.

The Stimson is 65 feet long, with beam of 14 feet 5 inches, and draws about 5 feet. Her power is an 80 h.p. Corliss motor. Some idea of the heavy construction of Pacific Coast work boats of all kinds may be gained by considering some of the figures on the Stimson. Her keel is of fir, 10 by 12 inches, and her keelson is of the same dimensions. Her frames are sided seven inches and molded seven inches at the heel and four inches at the head. Bilge stringers are four in number and are 3½ by 8 inches. Planking is of fir, 2¼ inches thick, and the boat is ceiled with 1⅝-inch fir. Her construction throughout is on this same staunch principle, so that she may breast any sort of weather she may encounter on her long trips.

The Stimson is of the raised-deck type, with ample quarters forward for a crew of four men. Like all Pacific Coast work boats of whatever type, she is electric lighted throughout.

Other well known lumber motor tug boats on the sound are the Potlatch, Browns Bay and William Crawford, designed by Lee & Brinton, the La Paloma, the Jim Row, etc.

To me, one of the most interesting of the smaller motor tow boats on the whole coast is the little Roustabout, work-



Marys Lake, Glacier National Park. Although used storms and high seas encountered in this moun- of commercial boat design

ing on Vancouver bay, in British Columbia, as a dredge tender. The Roustabout was designed in 1912 by Harry Bayfield, at that time superintendent of dredges for the provincial government of British Columbia. This little tow boat is 31 feet long, with beam of 9 feet over her planking, and draws 3 feet 6 inches. Her power is a 20 h.p. heavy-duty Buffalo motor, made by the Buffalo Gasoline Engine Co., of Buffalo, N. Y., and from the date that she was launched the Roustabout has given excellent service. Her engine-room and pilot house are in one, and she is a one-man boat in every sense of the word.

A combination towing and passenger motor boat that has given excellent account of herself since she was launched in 1912 is the Iskum, belonging to the Lillico Launch & Towboat Co., of Seattle. This boat was designed by Lee & Brinton, Seattle naval architects, to meet the need of a combination craft that could be used for towing work most of the time, but that could also accommodate excursion parties for day trips on the sound.

The Iskum is 56 feet long, has a beam of 13½ feet, and draws 5 feet of water. She has flush deck fore and aft, with a pilot house forward. A cabin giving full head room and fitted with small sash windows occupies the main amidship portion of the boat, and this cabin, which is low, has a railed upper deck with seats. A party of twenty-five people can be given the best of accommodations for a day's outing on this craft.

The Iskum is finished entirely in teak, so that she is one of the handsomest of her type anywhere on the coast.

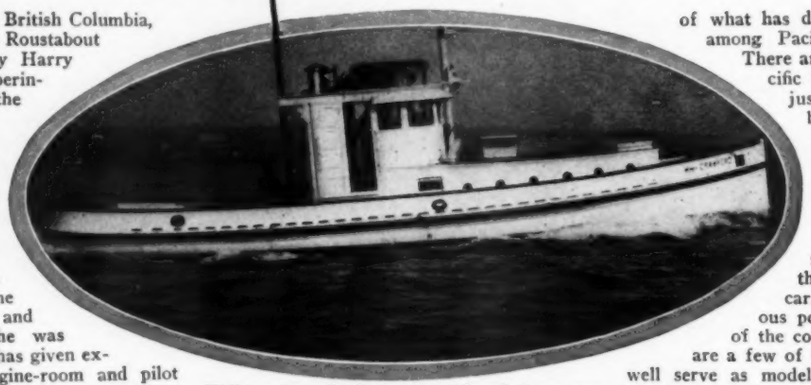
San Francisco Bay has a large number of motor tug boats that have been very successful indeed. The large fleet of the Crowley Launch & Towboat Co. includes several craft that are notable. One of the finest of these is the Crowley No. 19, 65 feet long, 17½ feet of beam and powered with a 110 h.p. Frisco Standard motor. This boat is flush decked, with a pilot house forward and trunk cabin over the motor room. She is not only speedy, but exceedingly powerful, and the work she accomplishes is almost unbelievable.

Much the same type of craft is the Condor, one of three 72-foot motor tugs owned by the Alaska Packers Association of San Francisco and all having 20 feet beam and 110 h.p. Frisco Standard engines for power. This is only a part of the fleet of motor tugs owned by this great fisheries company, some of which are fitted up with fire pumps and nozzles for use as fire boats in emergencies.

A mighty interesting motor tug used out of Honolulu harbor is the Makaala, owned by Young Brothers, who have quite a fleet of commercial motor boats in their service at the Hawaiian capital. The Makaala has a 140 h.p. Frisco Standard motor in her engine-room, and this takes her to sea very often with tows that would absolutely stump the average motor tug boat.

The expansion of the kelp reduction industry at Los Angeles and San Diego has caused the building of many new motor tugs, and as these craft have to handle the heaviest kinds of loads at sea they are powerfully built in every way.

Swift & Company, the big meat packers, have a large plant for making fertilizer of kelp, on the South Coast, and they have had several huge tug boats built by the Fellows & Stewart yards, fitted with 110 h.p. Union engines and these big, husky



William Crawford, an example of the motor tug employed in the lumber industry on Puget Sound

tow boats handle barges filled with hundreds of tons of kelp every day in the year.

One of the newest tugs for the kelp harvesting industry is the Diamond Queen, built by Fellows & Stewart for the Diamond Match Co., of Wilmington, Cal. The Diamond Queen is 62 feet 6 inches long, 14 feet of beam and draws 7 feet. Sawn frames of three-inch stock, doubled, a fir keel 10 by 12 inches in one piece, and a keelson 10 by 14 inches, also in one piece, give this tug a skeleton that even the old Pacific would find hard to crush. Her planking is 2-inch V. G. Oregon pine, fastened with ¼-inch square ship spikes. Her clamps and two sets of bilge clamps are 4 by 10 inches and 3 by 8 inches, respectively, and each in one piece. The balance of the construction is of the same heavy type, for this tug is meant for deep sea work in any old kind of weather. Her engine is a 100 h.p. Atlas motor, of three cyinder type. Electric lights throughout, of course. The Diamond Queen is designed to handle kelp barges carrying from 300 to 400 tons of kelp, some dead load for a motor boat to drag.

One of the most interesting general service tug boats on the South Coast is the Listo, launched in 1911 for the Wilmington Transportation Co., at San Pedro. She took the place at that time of a steam tug nearly twice her size. The Listo is 65 feet long, 15 feet of beam and draws 6 feet. A three cylinder, 135 h.p. Union gas engine furnishes her power, and some idea of the drag this motor tug can put forth is realized when it is understood that she is called upon several times a week to swing the huge steamships of the Pacific Coast Steamship Company, in the narrow ship channel at San Pedro, a channel too narrow for them to turn with their own motive power. With a line made fast well forward on the S. S. Governor, of 5,400 tons register, or the S. S. President, of equal size, she pulls them around with seeming ease, and has never failed to do the job to the full satisfaction to the gold-braided gentlemen away up on the bridge. And that is some compliment to a little motor tug.

The foregoing descriptions of Pacific Coast motor tugs will give the reader a clear idea of what has developed along this line among Pacific Coast motor craft. There are hundreds of other Pacific Coast motor tugs doing just as good work as these boats, and just as well designed and as well built and engined. But they conform in a general way in most cases to the tugs described.

Although there is still room for improvement in the fleet of motor craft carrying passengers at various points on the Pacific side of the country, nevertheless there are a few of these carriers that might well serve as models for the very best in this type anywhere. Lee & Brinton, of Seattle, have to their credit the designing of several of the best motor passenger boats I have seen anywhere. Of these, the most interesting, I believe, is the St. Marys, used on St. Marys Lake, in Glacier National Park. It is used exclusively as a passenger carrier, transporting tourists to the various points of interest on the beautiful lake, and has proved a very successful boat from every standpoint. Owners of motor passenger boats who seem to think that safety is not compatible with capacity in that type of craft should take a careful look at the St. Marys. This little boat, though on an inland lake, has to buck some of the stiffest weather that blows, breasting huge seas very often in the course of her daily work. For that reason her designers made safety the big consideration, yet she is so designed that there is a maximum of comfort and accommodation also.

The St. Marys is 65 feet long, of 14½ feet beam and draws about 5 feet, loaded. Like all Pacific Coast motor craft, her construction is heavy throughout. Her sides, amidships, are brought up flush to the height of the upper deck, and port lights are used rather than the usual sash windows found on the average passenger craft, thus making for safety in any weather. A narrow trunk extends most of the length of the upper deck, insuring light to the main cabin below. A pilot house forward houses the steersman. Seats arranged around the upper deck, on the after deck, and in the cabin below, accommodate over a hundred passengers, and their baggage is stowed in a hold forward, and on racks, so that they are free to move about without stumbling over handbags, etc., as is the usual case.

A Frisco Standard engine of 80 h.p. drives this heavy boat along at good speed, even when fully loaded. Of interest in this connection is the fact that the engine was taken apart when it arrived at the station nearest to the lake, and transported piece by piece on pack mules and skids up the mountain trails to the banks of the lake, where it was assembled again and installed.

Another of the Lee & Brinton passenger boats that has given excellent service is the Betty Earles, in service on Lake Crescent, up in the Olympic Mountains in western Washington. This boat was built in 1913. Little stormy weather is encountered on Lake Crescent, so the Betty Earles was built with sash windows flush with the sides, so arranged that they could be lowered on fair days. The craft is 65 feet long, with beam of 16½ feet, and her motor is an 80 h.p. Frisco Standard.

The wheel-house is just forward of amidships, with the engine-room directly below and passenger cabins both fore and aft of the engine-room. Seating capacity for 120 persons is provided.

Stimson, a heavily-constructed raised-deck motor tug of the type now almost universally used on Puget Sound in the lumber industry

(*To be continued*)

A successful concrete ship built at Moss, Norway, and rated by Lloyds as A1

Uncle Sam Contracts for Concrete Craft

Standardization Adopted for Concrete Motor Ships—U. S. Shipping Board Concludes Negotiations for the Construction of Cargo-Carrying Vessels

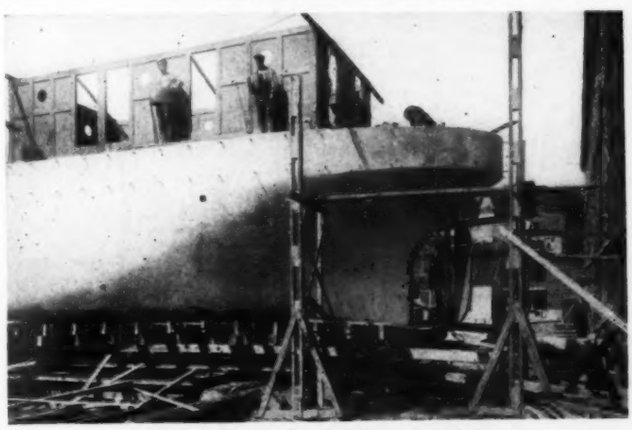
FOR some time negotiations have been carried on between the Government and Nicolai K. Fougner, the Norwegian engineer who built the first sea-going concrete motor ship Namsenfjord, shown in the accompanying illustrations, and on January 28 a contract was signed between the United States Shipping Board and the Fougner American Steelconcrete Shipbuilding Co., of New York, for one steelconcrete ship with a number to follow. The Government contract provides for the construction of cargo-carrying vessels of a capacity of 3,500 tons dead weight each.

In addition to the first sea-going concrete ship, Mr. Fougner's Norwegian company has built more than twenty vessels of concrete of different types and sizes, including the first concrete floating dry dock, coasting lighters of different sizes, barges, etc., and the first concrete tug ever built, and among this output is a lightship for the Norwegian government.

All of these vessels are at present in actual use in coasting service in different parts of Norway and the North Sea and have proved a commercial and technical success, carrying all ordinary kinds of cargo through severe conditions, involving ice and heavy seas.

Speaking of the work of his concern in Norway Mr. Fougner has recently announced: "Owing to the great demand for tonnage, our company has decided to standardize its output by centering upon motor-driven types of 360 tons, 1,000 tons and 1,600 tons. Aside from these the yard at Moss has contracted for an ore-carrying ship of 4,000 tons, provided with twin screws actuated by large Diesel motors. The first of our 1,000-ton ships was launched in December and the initial craft of 1,600 tons should be put overboard in January. I am satisfied that one of our larger boats will cross the Atlantic in the course of the coming spring."

Concrete shipyard at Moss, Norway



Stern of Namsenfjord before completion

The British authorities have been keenly interested in the activities at the Moss plant and the English government and Lloyds sent a commission to Norway to examine and report upon the concrete vessels turned out by the Fougner company. As a result, after extensive trial in rough weather, the Namsenfjord has received an official rating by Lloyds of A1.

The Namsenfjord is 84 feet long, 20 feet beam and 11½ feet deep from deck to keel, having a draft of 9½ feet. It is 200 tons dead weight or 350 tons capacity and is driven by a Bolinder crude oil engine of 80 b.h.p. producing a speed of 8½ m.p.h. There is a reinforced-concrete keelson with cross-frames of reinforced concrete every 4 feet. These frames are continuous along the sides and bottom of the boat, and are tied into the keel by rod reinforcing. Particular attention is paid to the continuity of this rod reinforcing in the transverse frames, so that the bottom side and deck frames, though cast separately, will form a rigid member. This is insured by continuous rods and by additional knee-brace rods at the corners of the hull. The skin, 3 inches thick, is of concrete reinforced with wire mesh or expanded metal. It is tied into the frames and especially reinforced with a longitudinal beam at the outer corners of the hull. There are center posts at intervals, of light wrought-iron pipe filled with

(*Continued on page* 62)

THE PRIZE CONTEST

A Few Remarks From MoToR BoatinG Subscribers

"Your magazine, in my judgment, is undoubtedly so far superior to the other magazines in the interest of this sport that I regard it in a class by itself."

"Those Prize Questions and Answers are alone worth the price of the Magazine."

"MoToR BoatinG as now published is about as complete as can be made. The topics chosen are right up to the minute and the general arrangement is above criticism."

"It is so good we can't do without it."

"MoToR BoatinG is the popular motor boating magazine of the United States. Its make-up is always first class. Its covers are striking. Its illustrations leave nothing to be desired. Its articles are authoritative."

"Your cruise stories are interesting to me because they are true stories and not fiction, which is what one wants in a magazine of this type."

"Your paper is so far in a class by itself that there can be no comparison between MoToR BoatinG and any other publication of its kind."

"The Prize Contest is a big feature. It gives more information on the subjects than anything I have ever seen."

The Effect of the War on Motor Boat Design

How Experience Gained From the Use of Motor Boats in the War Will Influence Design and Construction Practices in the Future

THE PRIZE CONTEST—Answers to the First Question in the March Issue

Seaworthiness More Valuable Than Speed

(*The Prize-Winning Answer*)

IF one thing has been brought home to motor boatmen with more insistent force than any other since the World War turned the thoughts of men toward the motor craft as units of military worth, that thing is the value of seaworthiness. To be a little more explicit, the quality demanded by Naval officials is seaworthiness combined with speed. Even our experimental war manoeuvers in 1916 brought out with emphasis the utter uselessness of motor craft, operating under war conditions, whose mere speed in sheltered waters constituted their only claim to military efficiency.

Before the War we had seaworthy cruisers—beamy, moderately powered, substantially built craft, which made long ocean runs successfully and took their time about it. Also we had light express cruisers which ran circles round the boats just mentioned in smooth going and sometimes put in a long day's run outside the headlands without a breakdown, incidentally shattering all records for the distance travelled. But we had never tried to combine genuine seaworthiness with high speed. By genuine seaworthiness I mean the ability to remain at sea continuously for many hours or even days under weather conditions such as will be encountered winter and summer off our North Atlantic Coast. The kind of seaworthiness that many years of development have incorporated into the build and equipment of those sturdy vessels that fish out of Gloucester. But with this difference: that the motor patrol boat or submarine chaser must have speed. Not the fickle speed of the hydroplane or the express cruiser but a rough water speed made possible first—by a narrow, seaworthy hull, easy of line, heavy of build, with a grip on the water fore and aft. A hull with topsides brought well up all around but especially forward, and flared just enough for dryness. Second—by a heavy, substantial power plant developing its generous horsepower at a comparatively low number of revolutions per minute. Authorities now consider 1,000 r.p.m. as the extreme speed for motors in sea-going motor craft. Twin or triple-screw installations are growing very common on craft showing the war influence, aiding materially in assuring added reliability and weight distribution.

And what about the crews of these war craft? It little matters what admirable qualities the shipwright or engineer have fabricated into hull or mechanism, if the human element has not received proper consideration. The quarters below should be comfortable under adverse weather conditions. Simplicity in fittings and furnishings is the keynote. Large living spaces with ample headroom are necessary. Upholstery should be durable and proof against dampness. A large, well-equipped galley will prove invaluable and a method of heating the living spaces is to be strongly advocated. Ventilation should be given attention and should not be dependent for its functioning upon smooth seas or clear skies. Attention to these details has a marked effect upon the morale of the crew.

On deck a pilot house or at least a permanent steering shelter is now considered indispensable. All deck spaces are protected by substantial rails of extra height. Weather cloths are rigged wherever such added protection proves helpful.

Under the most favorable circumstances life on small craft at sea is extremely fatiguing and the 80-foot chasers built for Great Britain and our own Naval 110-footers to an even greater degree show that the authorities are trying to make living conditions as bearable as possible on these ships of the mosquito fleet.

That the foregoing lessons learned by wartime experience will be easily forgotten is unlikely. Our boys of the Coast Defense Reserve are many of them drawn from the yacht clubs and will drift back into their cruising habits when released from Naval activities. They will not be satisfied with anything less than real boats now that they are learning the difference. And good speed will be in general demand since we are finding out that speed may be had without recklessly cutting down our weights and piling up our revolutions.

A. O. G.
Portland, Maine.

* * *

More Beam and Draft, Less Power and More Comfort

THERE is no doubt that the war will have a larger influence on motor boat design the same as it has and will further advance airplane and tractor development. The class of boats which will feel most particularly this influence will be the cruiser over 40 or 50 feet in length. The chief result which will be attained is the co-ordination of speed and weatherly qualities and, in the main, the motor yacht of the future, as the result of experience gained during the war, will be primarily seaworthy and at the same time will be capable of maintaining an average high rate of speed.

It is said that when our destroyers first went abroad they were looked on with considerable doubting concern by the English who had adopted standards involving greater beam and heavier construction than our boats with a consequent increase in power necessary to obtain the same speeds as American destroyers. Observation of our boats in action under the same conditions as the British destroyers has altered the original opinion and doubtless this will have a bearing on future design in small boats. It is the writer's opinion, however, that the high speed standards of the present as applied to pleasure motor yachts will be lowered in favor of larger accommodations and increased seaworthiness; that the express cruiser of to-day, attaining as high as 40 miles an hour, will, after the war, be supplanted by a craft with more beam and draft, powered less excessively, but capable of a cruising speed of twenty miles or perhaps a little more. The freeboard at the bow will still be high and the bow flare is, of course, here to stay; also very likely the present type transom stern, with the usual minor variations.

The matter of comfort on the yacht is im-

Questions for the July Issue

1. Is it your belief that there is any falling off of interest in the sport of motor boating? If so what are some of the causes and how do you believe interest may be revived?
Suggested by T. B., San Francisco, Cal.

2. How do you safeguard your gasoline supply from water and other foreign matter?
Suggested by A. O. G., Portland, Me.

3. Describe and illustrate some simple technical or scientific device (not necessarily applicable to motor boats) which might be applied or used in any connection toward winning the war.
Suggested by T. E. K., Cleveland, O.

Rules for the Contest

Answers to the questions, addressed to the Editor of MoToR BoatinG, 119 West 40th St., New York, must be (*a*) in our hands on or before **May 20,** (*b*) about 500 words long, (*c*) written on one side of the paper only, (*d*) accompanied by the senders' names and addresses. (The name will be withheld and initials or a pseudonym used if this is desired.) Questions for the next contest should reach us on or before the **20th of May.** The Editor reserves the right to make such changes and corrections in the accepted answers as he may deem necessary.

The prizes are. For each of the best answers to the questions above, *any article or articles* sold by an advertiser advertising in the *current* issue of MoToR BoatinG of which the list price does not exceed $25, or a credit of $25 *on an article* which sells for more than that amount. (*There are three prizes—one for each question—and a contestant need send in an answer to but one if he does not care to answer all three.*)

For answers which we print that do not win a prize we pay space rates.

For each of the questions selected for use in the next contest, *any article or articles* sold by an advertiser advertising in *this issue* of MoToR BoatinG, of which the list price does not exceed $5, or a credit of $5 *on an article* which sells for more than that amount.

All details connected with the ordering of the prizes selected by the winners must be handled by us.

portant, however, and it is common knowledge that the present type of express cruiser sacrifices comfort to speed, both as to cramped accommodations owing to narrow beam, and discomfort in a seaway owing to both lack of beam and draft.

Beyond this we cannot guess what the future may bring forth, but it is impossible, in view of the development in every other field for which the war has been directly responsible, to assume otherwise than it will very greatly advance motor boat design and in so doing will doubtless materially modify the designs of to-day.

G. W. B., New York, N. Y.

* * *

Standardization and Sturdier Construction

IN my mind there is no question but that standardization in the matter of both boats and engines will be the almost immediate effect of the present war on the boat-building industry.

The present conflict has developed a certain class of men who have built a number of boats, convertible they might be called, ideal for patrol duty, which, with little expense, can be stripped of their military air and converted into a first class cruising boat. Undoubtedly this trend will continue after the war, for unquestionably a practical standardized cruiser can be developed for even the man of moderate means, which in time of necessity can be used advantageously in the service of his government. These boats, of course, will be developments of both the round bilge and V-bottom types.

A builder concentrating on one or two models of approved design can turn out for the buyer a more economical outfit, first cost, running expense, and upkeep cost all considered. Although the model may be standardized, distinctive interiors may be arranged to suit the buyer's fancy.

The speed cruiser class will increase in numbers, due to improved design of both boats and engines. Slightly heavier construction is obvious from the experience of our present express cruisers in the sectional patrol. The extra weight necessary will be more than offset by the advance in motor design.

Power plant refinement has been mostly responsible for the development of the present express cruiser, but the various makes are far from standardized. No doubt in the near future this standardization will be carried out in the marine type as it has been in the automobile.

C. R. M., North Dartmouth, Mass.

* * *

Refinement of Design to be Expected

THE question as to whether the war will materially modify motor boat design and construction opens a vast field of conjecture for the average yachtsman.

The one thing which is strikingly apparent to the interested observer and proves the stability of the motor boat industry is the fact that there have been few changes in engine and boat design in the last few years. Have we at last arrived at the stage of perfection where necessity ceases to be the mother of invention? I hardly think so. With the further progress of the war certain types of boats, particularly adapted to the purpose in view, will be designed along lines to further increase the efficiency of the boat with the least expenditure of power.

That the refinements of design so developed will be used by our naval architects in the future is to be expected. Among the larger boats the general trend will probably be toward the military type of cruisers and will be imitated to some extent in the general design of smaller boats.

In general practice the underwater design will show very little change from the past year or so. Any radical departure from the conventional type now in vogue will show a decided leaning toward the V-bottom type and judging from past personal experience, the change will be inevitable up to certain sizes of boats.

A noteworthy feature that should be considered is the tendency of builders to specialize irrespective of size or type on stock models or, as it is now called, a standardized design. This does not mean that the day of the boat designed to meet the owner's special requirements is past, but is to be considered as an effort on the part of builders to protect the prospective purchaser from much worry and unnecessary expense as is often the case with experiments.

Conservatively speaking, any radical changes in the general design of motor boats or their construction will largely depend upon the motor boating fraternity whose particular whims must be catered to. Whatever changes will occur will be gradual and likewise absorbed until a standardized type has been evolved which shall embody the best features and refinements that the war will develop.

Perhaps the most notable changes will be in the motor equipment and that will be principally to larger power; the twin screw plant, wherever practicable, will probably be more popular than ever before. A noteworthy feature of the marine motor industry is the attempt to induce manufacturers to standardize marine motor practices.

To briefly sum up the situation, the fact that little variation is demanded of the tried and proved satisfactory type is to be taken as an indication that very little change may be expected after the war.

T. P. K., New York, N. Y.

Stuck Valves and the Remedy

The Sticking of Valve Stems May Be Caused by Many Things, Most of Which Can Easily Be Remedied

THE PRIZE CONTEST—Answers to the Second Question in the March Issue

Graphite and Grease a Great Help

(The Prize-Winning Answer)

IN comparison to the number of motors in use and the great amount of work each does, sticking valves, as a motor trouble, could almost be called a negligible quantity. There are cases, of course, where this trouble does occur, but with the mechanically operated valves now almost exclusively used, it is not very frequent. Where it does occur it is usually due to some defect.

There is really little reason why either the intake or the exhaust valves should become stuck, as they are operated by cams which will raise them against considerable pressure and the springs will close them even though the stems are dry and gummed up to a certain extent from the use of improper grease or oil.

There are cases, however, where the valve stems will become rusted so that even though opened by the cam the strength of the spring is not sufficient to overcome the excessive friction and return the valve to its seat. Two instances of this rusting of the valve stem were traced to water getting into the cylinder from two different sources. In one case it was noticed that after the motor had been standing for two or three days it would miss and back-fire considerably. It was finally found that the exhaust valve of the rear cylinder was stuck open. A tool was used to force it to close, and after two or three strokes it resumed its function and the motor ran all right. This performance was repeated several times and finally it was decided to take out the valve and investigate the cause of the trouble.

On removing the offending valve, at a time when it was stuck open, the stem was found pitted and covered with rust, and there was some water in the valve pocket around the stem hole. The question to decide was how that water got there. The water jacket was tested, but no leak could be found. It had been noticed that if the motor was left standing with this particular exhaust valve closed there was no trouble with the valve sticking and this led to the suggestion that perhaps the water from the exhaust pipe was in some way drawn back after stopping the motor. The water from the exhaust manifold water-jacket was piped into the exhaust only a couple of inches below the elbow at the end of the manifold. It was decided that this was too close and a new hole was drilled about six inches further away and the water outlet connected there. After making these changes there was no further trouble with the valve.

Another case of the same kind was also caused by water getting into the valve pocket, but in this instance it was due to a small sand hole in the water jacket which, while not large enough to cause trouble while the motor was running, would nevertheless let enough water run in around the valve stem when the motor was left standing to rust it and cause it to stick. This trouble was remedied by removing the cylinder and filling the water jacket with a solution of copper sulphate, which, after standing, sealed up the small hole and cured the trouble.

In a very closely fitted valve stem trouble may be experienced with sticking if no lubricant is supplied or if on inserting the valve a poor grade of grease has been smeared on the stem. The best way to lubricate a valve stem not supplied with a means for oiling is to rub it well with a mixture of flake graphite and oil. The graphite will stand the heat and also lubricate even though dry.

Aside from such cases as these there is very little chance of trouble from sticking valves, and when a valve does stick the cause of its inaction is usually easily found.

A. L. M., Brooklyn, N. Y.

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Often Caused By Too Rich a Mixture

STUCK valves are usually caused by a collection of carbon or overheating of valves and guides. Both causes may be traced to one or all the following causes, namely, too rich a mixture, too much oil or too little oil and an imperfect water-cooling system.

It is a well-known fact that a rich mixture is a slow burning one; the gases not being fully consumed in the cylinder continue to burn while passing through the exhaust valves and manifold, thus heating the valves and guides, making them hotter than they would be if a proper mixture were used. In addition to the excessive heat a quantity of carbon is baked on the valves and seats. The valve stems expand enough to stick and the carbon bakes fast and holds them even after the motor has cooled off.

Too much oil, or a poor quality of oil, will cause a collection of carbon under valves which at first holds them open a little and finally bakes them fast. A poor cooling system aggravates each of the above causes, as it allows the moving parts to become overheated.

The remedy is obvious but not always quite as simple as it sounds. Get your mixture right and keep it right. Keep your spark far enough advanced to insure good combustion, as a badly retarded spark causes a slow burning mixture. Use enough good oil (that doesn't leave a carbon deposit) to lubricate the pistons, but no more than is really needed. See that your water jackets are clear and your pump delivering enough water. Clean and grind your valves as often as experience shows they need it.

Of course if there is any chance for water from the cooling system or the exhaust line to reach the valve chamber the chances are that the stem will rust fast, but trouble from this source is easily found and remedied.

If you wish, you can use one of the numerous carbon removers, or, if you prefer, the good old remedy of pouring a little kerosene into each cylinder immediately after shutting down, while the motor is still hot; this often gives good results. The disadvantage of this latter method is that more cranking is necessary to get started the next day and often the oil will have to be cleaned from the spark plugs.

D. E. W., Ithaca, N. Y.

See That the Valves Seat Tight

THERE are several causes which make valves stick, viz., poorly seating heads, warped heads, loose or worn stems, weak springs, loose or worn tappet guides.

Taking up the poorly seating heads first, we find poor compression, which naturally produces an excess of carbon due to poor combustion, also an excess of oil. At the time of the explosion part of the burning gas passes through between the head and the seat. Some of this leakage finds its way down around the valve stems. This, in time, coats the stem with a sticky deposit of carbon. At average or high motor speed this holds the valve open. While it not only cuts down the power through poor compression, it allows some of the exhaust gas to be drawn back into the cylinder and this heated exhaust raises the temperature of the incoming gas and it also helps to cut down the volume of the fresh charge. This causes a still greater loss of power.

Now, if this continues we get the second reason, which is only the result of the first cause. The intense heat of the burning gas passing through between the seat and valve head tends to warp the head. This leaves a still greater deposit of carbon to gather on the stem, until finally it fails to close.

As a rule the first two reasons cause most of the valve trouble, but loose or worn stems contribute their share. A loose stem allows a certain amount of cold air to be drawn up around the stem. At low speed this is more noticeable and causes back firing due to the very lean mixture, which is highly inflammable. It comes in contact with the still burning gas as it is being exhausted, or some incandescent point in the compression space, and causes back firing. This leaves a deposit of carbon on the stems which in time becomes so thick and heavy that the tension of the spring will not bring the valve down on its seat.

Weak springs let the gas leak through and we get the same result. They cannot hold the valve head closed and the pressure from the explosion carries the carbon deposit down to the stem.

Worn tappet guides tend to hammer the valve stem out of true. They do not lift straight up, but pound off to one side, which in time bends the stem below the guide. At high speed the valve is thrown higher than the lift of the cam and finally it sticks at the bend. With the little clearance given between the valve and the stem it needs only a few thousandths of an inch to make it bind.

Properly seating heads, close fitting stems and tappets, springs of the right tension, also the correct clearance between the lift and the stem, will effect a permanent cure for sticking valves.

P. T. H., Philadelphia, Penn.

* * *

A Narrow Seat a Great Help

A VALVE which sticks, or does not seat tightly is a nuisance—and dangerous. Likely to allow unburned mixture to accumulate in manifold and cause an explosion. Sticking valves are generally caused by oil, gumming or burning on stem, spring not strong enough to overcome the trouble; not noticeable when running slow, but when you get up speed the music begins. The usual remedy is to clean the valves and try another maker of oil. When you get a good oil stick to it. Forget the price.

Sometimes the engine gets too much oil—carbon will collect on the stem, between valve head and guide—if the spring is not strong enough to shear this off it will hold the valve partly open. The valve stem may have a flat place or shoulder on one side and a slight rotation of the valve may cause it to bind in the guide. Occasionally the stem is bent slightly, causing it to stick. If a spring is not tempered evenly it will exert more pressure on one side and cause trouble. Some springs are large diameter and not tapered at retainer end. If ends are not ground square they will cause uneven pressure. Sometimes the valve stem and tappets, or push pins, do not line up, causing uneven wear. Engine design may not have allowed sufficient length of guide for long wear.

In refacing valves the writer makes a practice of refacing the valve head either on centers or by holding the stem in an accurate running chuck, filing carefully and easily with fine flat file, to get seat perfectly concentric with stem, then filing valve head slightly convex. A narrow seat is just as tight as a wide one, less surface for carbon, scale, etc., to lodge on; it will break up a flake of carbon where a wide seat might allow it to lodge. If you have half a dozen extra valves, springs and retainers in your locker, you will not have a great deal of valve trouble.

D. A. R., New Castle, Penn.

Prevent Chafing at the Transom

Several Methods of Making and Fitting Metal Angles to Prevent Chafing at the Stern Ends of a Boat's Planking

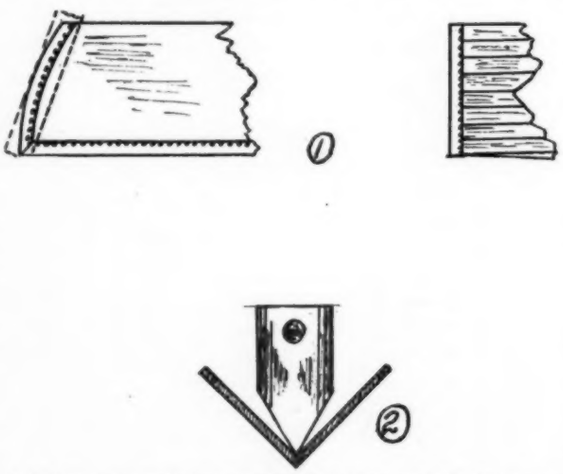
THE PRIZE CONTEST—Answers to the Third Question in the March Issue

Angles Not Always the Best Protection

(The Prize-Winning Answer)

IF the transom stern is plumb and not veed, a regular rolled brass angle can be fitted quite easily, as the sides of the angle required form a right angle. See sketch one. Cut two pieces of angle, each just a little longer than required for each side, drill holes in one flange of these angles before bending, and use these holes for bolting the 1-inch by 1-inch iron bars each side. These iron bars should extend beyond the angles at one end to give some means for fastening a long lever, such as a 2 by 4, for easy bending.

This assembly can be bent as easily as a solid bar of this size, and the angles will come out without being distorted as would be the case if they were bent without the bars, or bent singly. The outline of the stern made on paper will be more convenient to fit to while bending. The holes previously made can now be countersunk on the outside, and the holes drilled in the other flanges. The angle is set in flush with the surface of the planking and fastened with flat-head screws. The angles used are 1- by 1-inch brass, but larger can be used.



H. H. B.—Angles made from strips of sheet brass cut to fit the transom and soldered together

If the stern is veed or raking, then the angle between the sides will not be a right angle, and stock angles cannot be easily bent to fit these edges. See sketch two. It will be necessary to make two wood patterns, one for each side, from 3/16-inch wood, with the sides nailed and glued together to the exact angle; the inside edge filled up; and two or three braces (see sketch) fitted to keep the angle.

These long, thin patterns will twist out of shape lengthwise, but this will not matter so long as the side angles

are maintained, for as they are to be cast in brass or bronze they can be twisted back again after casting. The braces are not needed in the casting, so they can be chipped out; the outside surfaces polished; drilled and countersunk; then set into the planking and fastened as number one.

This style of stern can also be fitted with a quarter round edging, fastened with flat-head screws as shown in sketch three. Both sides can be bent at once by using half round and sawing apart afterwards, as it is a little difficult to bend quarter round by itself.

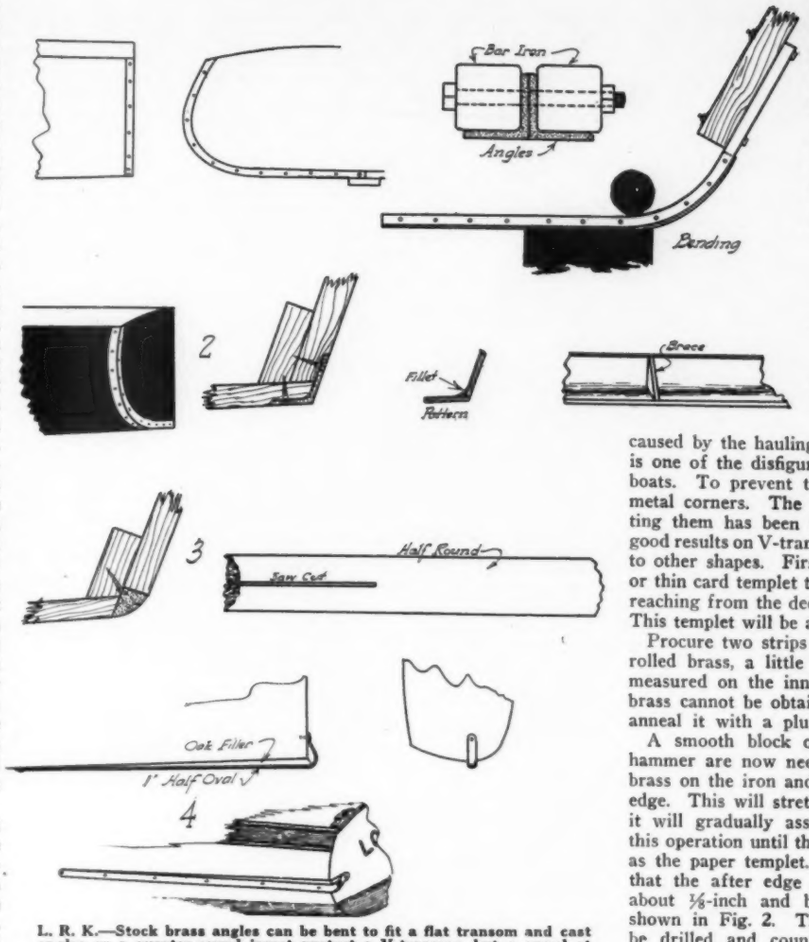
My own opinion in regard to binding the edges is that it is more trouble than it is worth, although it does give a certain finished appearance. I had a boat of this type for about four years that was not edged with angles, and the ends of the planks are as good to-day as ever, but they were protected as well as the after sides of the boat by a rub streak each side extending forward about four feet. See sketch four.

They were placed at the widest part of the hull, and consisted of 1-inch half oval galvanized iron, bolted through the planking to the frames. Between the planking and the iron was a tapered filler strip of oak, tapering from nothing to 1 inch thick at the stern and then rounding the corner.

These strips were fastened with flat-head bolts very securely, and took a great many bumps, and still are tight; while with angles it seems no matter how well they are fastened, the sharp end of a slip or wharf, if it gets a good chance, will rip them loose.

L. R. K., Philadelphia, Pa.

* * *



L. R. K.—Stock brass angles can be bent to fit a flat transom and cast angles or a quarter-round insert protect a V-transom, but a guard at the greatest beam the best protection of all

Solder the Pieces to Form an Angle

THE following description will explain how the writer made and fitted a brass angle around the stern of a boat some seasons ago. The scheme worked perfectly and has given good service.

We will assume that the craft in question has a stern shaped as shown in the portion of the accompanying sketch marked one.

First make a full-size paper pattern of the stern. Having decided on the width of metal you wish to use (about one and one-half inches wide and one-sixteenth inch thick is good) lay this off on the pattern.

The curved portion will have to be cut from a flat piece as indicated by the dotted lines. Two of these curved pieces are, of course, necessary, as only one-half the stern is shown in the sketch. A little figuring will show how these pieces may best be cut, to allow for the least waste.

The outer portion of the angle, which extends parallel to the axis of the boat, may, in this case, be made from one continuous strip of brass one and one-half inches wide. Another piece of this strip is used across the bottom of the transom. From your pattern determine the length of brass needed.

When purchasing the brass it is best to buy that known as medium hard or half hard; the spring quality is too hard to work readily, and the soft does not hold its shape very well.

Having procured the brass, cut each piece to shape and carefully fit it, drill and countersink holes for small brass flat headed wood screws on one inch centers.

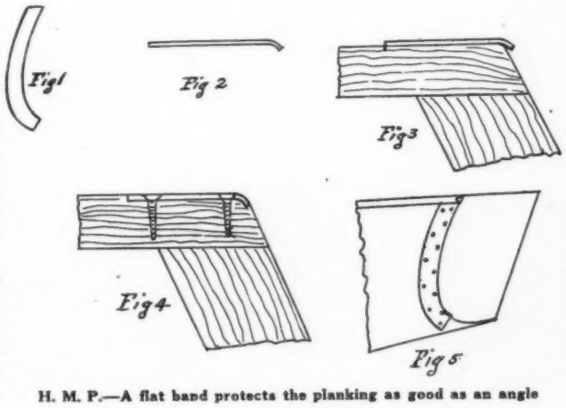
Now put all of the pieces in place, holding them with a few screws. The joint should fit well, and will if the work has been carefully done. Put a small touch of solder every four or five inches to hold the angle together and remove the whole thing.

If you will take the time and trouble to make a small soldering iron, with the handle at right angles to the head, you will be well repaid by the ease and dispatch with which the final soldering may be done.

Use a good flux and solder the inside of the angle all around, running the iron as shown at two. Put on plenty of half-and-half solder and make a good solid joint.

Put the band in place, drive in all of the screws, and give it a coat of paint to match the hull, and you will have no more chafed plank ends.

H. H. B.,
Schenectady, N. Y.



H. M. P.—A flat band protects the planking as good as an angle

* * *

A Very Simple Method

THE chafing of the stern of square and transom stern boats caused by the hauling of the tender alongside is one of the disfigurements of finely finished boats. To prevent this it is necessary to fit metal corners. The following method of fitting them has been used by the writer with good results on V-transoms and can be adapted to other shapes. First, cut out a heavy paper or thin card templet to the curve of the corner reaching from the deck to about the waterline. This templet will be about the shape of Fig. 1.

Procure two strips of 1/16 by 1½-inch soft rolled brass, a little longer than the templet measured on the inner curve. If soft rolled brass cannot be obtained, get hard rolled and anneal it with a plumber's torch.

A smooth block of iron and a machinist hammer are now needed. Place the strip of brass on the iron and strike lightly along one edge. This will stretch the metal slightly and it will gradually assume a curve. Continue this operation until the brass is the same shape as the paper templet. Now hold the strip so that the after edge overlaps the iron block about ⅛-inch and bend the edge down as shown in Fig. 2. The screw holes can now be drilled and countersunk. A small hand drill is fine for this work. Use ¾-inch No. 10 brass screws.

Now start to fasten the strip on, commencing at the deck and using a short temporary screw, and bend the strip to the planking, allowing the bent edge to extend over about as shown in Fig. 3. If the templet has been properly made and the strip made to the templet, it will fit very closely. If not you may have to use the iron block and hammer again. If the strip when bent down to the planking fits the stern closely the permanent screws can be put in. Now take a sharp knife and run it along the forward edge of the strip, cutting into the planking about 1/16-inch and with the hammer and a block of end grain hard wood drive the strip into the planking until it is smooth with the surface. This method is good if the planking is cedar or other soft wood, but if it is of mahogany or other hard wood, the strips should be fastened temporarily until the knife cut is made and then removed and the planking thinned down with a chisel and small plane about the thickness of the strips. The final bending of the stern edge must be done after the strips are permanently in place, owing to the constant changing of the angle of the stern and sides.

The work, when finished should look like Figs. 4 and 5.

On a boat where the transom is oak or mahogany and finished in natural color, this method of protecting the stern will not disfigure the transom as would be the case were the brass binding in the form of an angle, and overlapping the transom about 2 inches. Even when the transom is painted it is hard to make a neat job so that the brass will not show, but this method is just as effective, easily done, and costs less.

H. M. P., Brooklyn, N. Y.

Built Up Angles Serve the Purpose

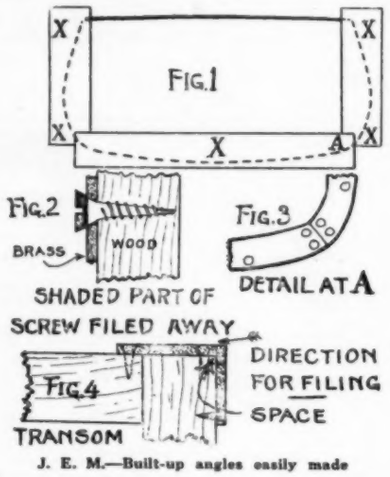
STERN angle irons moulded from carefully prepared templets are superior to any other, but to inexperienced workers they present difficulties in the making. Built up ones can be made easily and serve their purpose practically as well.

The amount of material will depend upon the size and the shape of the transom. On the floor or other flat surface, make a full size chalk outline of the transom and draw thereon rectangles placed similarly to those in Fig. 1. The idea in so doing is to get the length, width and shape of the strips for the transom, at the same time to get the strips for the plank ends from that which is left after the transom strips have been cut out. These latter are cut from the areas marked X.

It will be seen that there will be three strips for the transom and the same number for the plank ends. The method of cutting will be a hack-saw.

Fig. 3 shows the method of butting the transom strips at A. By making the side rectangles a few inches longer than necessary, the plank end strips will be long enough to meet at a point lower than A but joined in the same manner.

Flat head brass screws (No. 9) should be used in fastening the strips, in this case the wire being well proportioned to the length for holding power.



J. E. M.—Built-up angles easily made

The reaming for the head should be smaller than usual, just enough to conform to the idea illustrated in Fig. 2. When the shaded portion of the screw is filed away, the screw and the adjacent brass to all appearances will be one and the same piece. All edges are filed and finished with sand paper as well as the plane surfaces.

Do not use undue pressure in reaming for the screw heads, for the depression so caused will make the proper filing away of the screw heads difficult, at the same time will not allow of the brass being properly polished later on.

As shown in Fig. 4, there is a slight space designated by the arrow which allows the strips to butt tightly and make an almost indistinguishable joint after the filing process. To get this space it will be seen that in attaching the transom strips the outside edges will be allowed to extend 1/32 inch beyond the outside edge of the transom.

Sometimes the strips are attached to the top of the transom and the covering board, but this is not essential on all boats.

J. E. M.
Norwich, Conn.

Develop Inland Waterways

What the National Rivers and Harbors Congress is Doing for the Inland Waterways

PART II

By S. A. Thompson

WHILE the friends of the waterway cause were lulled to sleep, its enemies were wide awake and active all the time. No general river and harbor legislation was enacted in 1903 or 1904, and when a bill was passed in 1905 it carried only a little over $35,000,000. This drop of $30,000,000 from the bill of 1902 made the waterway people begin to sit up and take notice.

For more than twenty years the Ohio Valley Improvement Association has been continuously at work for the improvement of the Ohio river. They secured the insertion in the River and Harbor Bill of 1905 of a provision for a survey and report by a special board of Army Engineers and in June of the same year took the members of the Rivers and Harbors Committee of the House of Representatives on a steamer trip from Pittsburgh to Cairo in order that they might have first-hand, personal information for their guidance when they should come to consider the report to be made by that Board.

Stops were made at all the towns along the route and there were bands, processions, banquets and oratory galore. At a banquet in Cincinnati, Representative (now Senator) Ransdell, of Louisiana, who was one of the speakers, suggested that it would be wise for all the friends of waterways to unite in a national organization for the furtherance of their cause, and urged that such an association should be formed at once. The suggestion met with hearty approval, and at a conference of delegates from several waterway associations, which was held in Cincinnati a little later, it was decided that a national convention should be held in Washington early in the following year.

The call for this convention, which assembled at the old Arlington Hotel on January 15, 1906, was issued by the Executive Committee appointed by the Baltimore Convention of 1901, and it was decided to retain the name which had been adopted there. Hon. Harvey T. Goulder, of Cleveland, O., was made president, and Capt. J. F. Ellison, of Cincinnati, became the secretary-treasurer and active manager of the organization. Of the latter it has been truly said:

> "Never was a wiser selection made. When Captain Ellison took the helm in January, 1906, the organization existed in name only; it had no exchequer; it had no contributing members; it had nothing but a good cause and some ringing resolutions. He went to work with great energy, assisted somewhat by the chairman, and soon found a helper worthy of himself in John A. Fox, who proved a veritable St. Paul of waterways, preaching their gospel in every corner of the Union."

Captain Ellison served as secretary-treasurer of the Congress until December, 1911, when he resigned, being succeeded by the writer who had been engaged for some time as field-secretary and has had "water on the brain" for more than thirty years.

Two conventions were held in 1906, the first in January and the second in December. Both were held in Washington and a convention has been held in that city in December of each year since, until 1916. The convention called for December, 1917, was postponed because the overcrowded conditions in the Washington hotels made it impossible to secure accommodations for the delegates.

At the January, 1906, convention Representative Jos. E. Ransdell, who had suggested the formation of a national waterway association, was made chairman of the Executive Committee, and at the December convention of that year was made president of the National Rivers and Harbors Congress, and has held the position continuously ever since. Living as he did, and still does on the banks of our greatest river and in a state which claims to have more miles of navigable waterways than any other in the Union, it is natural that interest in waterways has "grown with his growth and strengthened with the years."

From the very beginning of his Congressional career, in 1899, he took an active part in all waterway legislation and was soon made a member of the Rivers and Harbors Committee. He served continuously in the House until he entered the Senate, in 1913, where he was at once made a member of the Commerce Committee. He is a thorough student and a tireless worker, and a large share of the credit for the position attained and the work accomplished by the National Rivers and Harbors Congress must be awarded to him.

The National Rivers and Harbors Congress is a purely voluntary organization which is supported entirely from the dues of its members and the contributions of those who believe in the work it is doing. Its membership, which extends to every part of the United States which has a harbor or a navigable stream, is made up of individuals, firms or corporations, commercial organizations, waterway associations and municipalities.

Its government is vested in an Official Board, of which the president and the secretary-treasurer are ex-officio members, made up of a vice-president from each state interested in waterways and directors chosen to

(*Continued on page* 64)

One of the pleasures enjoyed on inland waters

Practical Navigation for Motor Boatmen

Checking Position by Dead Reckoning
Applying a Longitude Factor
Fixing a Ship's Position
St. Hilaire's Method

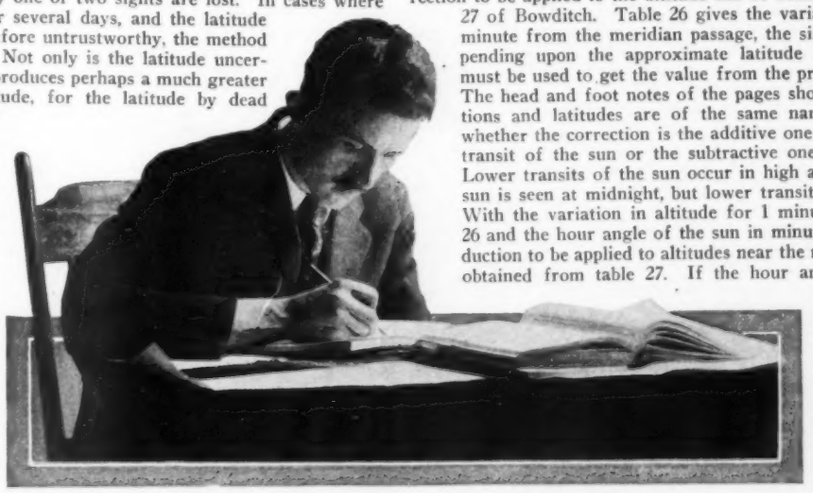
By W. Mack Angas

IN SEVEN PARTS—PART VII

Sumner's Method of Ship Location
Backing and Filling
Aquino's Method
Star Sights

BY the use of dead reckoning in conjunction with meridian altitudes of the sun and time sights a vessel can be navigated as long as the weather permits the taking of sights each noon and in either the morning or afternoon of each day. Vessels are navigated in practice in just this way, and indeed up to the time of the discovery of the Sumner Line by Captain Thomas Sumner in 1837 the only known method of position finding was the above-mentioned combination of dead reckoning, meridian altitudes, and time sights. Because the method is interesting historically and is still much used in the merchant service by navigators of the old school, it seems worthy of a short description and an example. It consists of nothing but a combination of three problems in navigation, all of which the student should understand by now. Upon leaving some convenient aid to navigation from which a departure can be taken, the navigator "takes his departure," puts over the patent log, and sets his course for the destination. Suppose this to have been done in the early morning. An a. m. sight for longitude would be unnecessary, for only a few miles would have been run from the point of departure, but it would probably be wise to take a meridian altitude of the sun at noon and compute the noon position, the latitude being by meridian altitude of the sun, and the longitude by dead reckoning. At about four in the afternoon a p. m. chronometer sight would be taken and the position again computed, using the latitude obtained by applying to the noon position the run of the ship from noon until the time of the p. m. sight. This process of working forward from one sight to another would be continued to the end of the voyage, the sights being probably all of the sun, though star sights can be used sometimes to great advantage in working in this way. Problem 1 illustrates the process fully as far as the sun sights are concerned.

When for any reason it is impossible to obtain one of the sights usually taken when navigating by this method, the position is, of course, carried forward to the next sight by dead reckoning. This will not be a serious matter if only one or two sights are lost. In cases where no sights are obtained for several days, and the latitude by dead reckoning is therefore untrustworthy, the method has a serious drawback. Not only is the latitude uncertain, but this uncertainty produces perhaps a much greater uncertainty in the longitude, for the latitude by dead reckoning is one of the factors used in working a time sight for longitude. The degree of uncertainty in the longitude caused by error in the latitude will depend upon the bearing of the sun when the sight was taken. The table of longitude factors, table 47 in Bowditch, shows that when the sun bears east or west, that is, when it is on the prime vertical, the longitude is unaffected by small errors in latitude. With the sun more than 45° from east or west, errors in latitude will produce large errors in longitude. As has been pointed out previously, time sights with the sun on the prime vertical are impossible for more than six months out of the twelve, so other methods have been devised for eliminating error in longitude due to error in latitude.



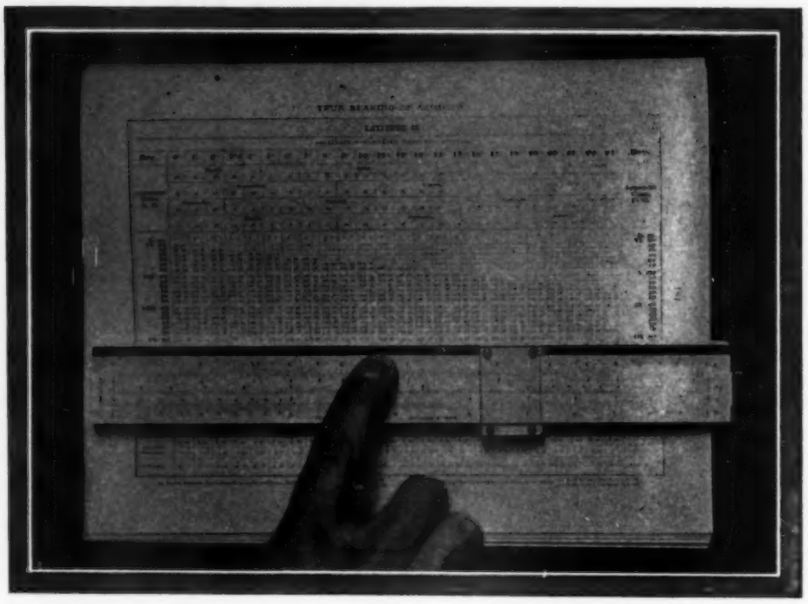
Like all graphical methods the St. Hilaire is inconvenient to use in many cases, but the fine results it gives justify one for putting up with the inconvenience of a graphical method

These various processes are used at different times to meet different conditions; perhaps the simplest of the lot is the ex-meridian altitude of the sun, which is not a method of working longitude at all, but is merely a way of determining latitude by a sight taken near noon. The ex-meridian guards against the loss of a sight for latitude when a cloud crosses the sun just when it is on the meridian, and therefore the ex-meridian prevents rather than cures these troubles due to inaccurate latitude. The principle of the ex-meridian sight is to take an altitude of the sun when it is near the meridian and apply to this altitude a correction which will show what the altitude would have been had the sun been on the meridian. From that point on the sight is worked just as is a meridian altitude of the sun. The size of the correction very naturally depends upon the distance the sun is from the meridian, or, in other words, the correction depends principally upon the hour angle of the sun, though the latitude and declination also affect it slightly. The hour angle of the sun is the difference between the watch time of the sight and the calculated watch time of the meridian passage of the sun and must not be greater than 26 minutes. Of course, an hour angle smaller than 26 minutes is desirable; the smaller the hour angle, the more reliable the sight, other things being equal. One way of computing the watch time of the meridian passage is described in the article on meridian altitudes of the sun, and another method is taken up in Bowditch on pages 179 and 180, paragraph 403; both ways are applicable to the ex-meridian method. Having obtained the hour angle of the sun or the number of minutes that the sight was taken before or after local apparent noon, the correction to be applied to the altitude can be obtained from tables 26 and 27 of Bowditch. Table 26 gives the variation in altitude in one minute from the meridian passage, the size of this variation depending upon the approximate latitude and declination. Care must be used to get the value from the proper part of the tables. The head and foot notes of the pages show whether the declinations and latitudes are of the same name, or vice versa, and whether the correction is the additive one for the ordinary upper transit of the sun or the subtractive one for the lower transit. Lower transits of the sun occur in high altitudes only where the sun is seen at midnight, but lower transits of stars are common. With the variation in altitude for 1 minute obtained from table 26 and the hour angle of the sun in minutes and seconds, the reduction to be applied to altitudes near the meridian may be readily obtained from table 27. If the hour angle is large it will be necessary to interpolate in table 27 for the final correction, which, when applied to the "corrected altitude of the sun's center," will give what the altitude of the sun's center would have been had the sun been on the meridian.

When no sights have been had for several days three methods

can be used to overcome the trouble. The methods are commonly spoken of as "Backing and Filling," "Applying a Longitude Factor," and "Sumner's Method." There are several modern forms of Sumner's method, such as St. Hilaire's "Method of the Calculated Altitude" and Aquino's Method, but these are in reality only short cuts in the method devised by Captain Sumner. The advantages and disadvantages of all these different ways of finding a vessel's position will be taken up as each method is described in detail.

Backing and filling is as simple in theory as the ordinary method of working forward from sight to sight which has been described. If bad weather which has prohibited the taking of sights for several days is followed by such a fine day that without doubt sights can be taken at any time the backing and filling procedure can be readily applied, provided that an accurate fix of the vessel's position is not required before noon. In backing and filling the a. m. sight is taken at the usual time and if an approximate fix of the ship is desired as an a. m. position the sight may be worked out with the latitude by dead reckoning. At noon a meridian altitude of the sun is taken and from the latitude thus obtained the a. m. latitude is found by applying to the noon latitude the run from the a. m. sight to noon *backwards*. In other words, the a. m. latitude is found by figuring back from noon instead of figuring forwards from the previous latitude sight. With this accurate a. m. latitude the morning sight is worked for longitude. The run to noon is applied to this a. m. longitude in the usual way and thus the latitude and longitude at noon are accurately known and a good fix is therefore obtained. An example illustrates the method which is less laborious than the description would lead one to believe. The reader should note carefully that the diff. lat. and diff. long. are found but once and that once these figures have been obtained the working backward and forward from one sight to the other is a mere addition or subtraction and not a long problem in dead reckoning as one might suppose.



Using the Azimuth tables. As in some of the large Bowditch tables a ruler should be used as a guide

The longitude factor is used in exactly the same cases that would justify the use of backing and filling and the method accomplishes the same thing as does backing and filling with decidedly less work on the part of the navigator. The a. m. sight is worked in the usual way using for the latitude the value found by dead reckoning notwithstanding that this latitude is untrustworthy. At the same time that the sight is worked the azimuth of the sun is looked up in the tables. The local apparent time found from the time sight will be accurate enough for getting the azimuth from the tables in spite of a possible large error in the latitude. The a. m. position obtained from the sight is then carried on to noon by the usual methods of dead reckoning and a meridian altitude is taken to give the true noon latitude. A comparison of the noon latitude by observation and by dead reckoning gives the error in the latitude by dead reckoning at noon, which is probably the error in the morning latitude, and from this error in the approximate latitude, and the azimuth of the sun the corresponding error in longitude is ascertained from table 47. The columns headed Bearing in table 47 are the number of degrees in the bearing of the sun according to the old-fashioned quadrant compass marking. The particular quadrant in which the sun's bearing lies does not affect the size of the correction to be applied to the longitude but does affect the way in which the correction is to be applied. A simple diagram of the sun's bearing and a line of position at right angles to it will enable one to determine whether the correction to the longitude is to be added to, or subtracted from, the longitude obtained by the morning sight. Such a sketch accompanies a problem illustrating the application of a longitude factor, the data of the problem being the same as was used in the backing and filling problem. Note that the correction is applied directly to the noon longitude instead of to the a. m. longitude Applying the correction to the a. m. longitude would give the same result, but would require a little more work as the morning longitude would have to be carried forward again to noon in order to give the noon longitude and complete position.

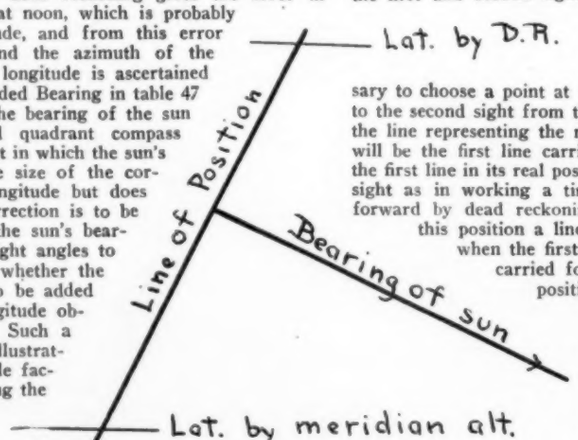


Figure to accompany problem 3. The latitude was less than it was thought to be so the ship was further down the line of position and therefore further west

Beyond doubt the best of all methods of ship location is "Sumner's Method" or the combination of two lines of position. The great advantage of this method over those previously described is that it enables an accurate fix of the ship to be made before noon, a feature which is particularly useful when land fall is to be made on the first clear day after several days of bad weather. A simple, and at the same time, accurate way of getting a line of position from a time sight is to work the sight in the manner described previously, and look up the azimuth of the sun for the time at which the sight was taken. From the azimuth of the sun its true bearing can be readily obtained by a mental calculation if it be remembered that in the northern hemisphere azimuth is the angle from north round to the bearing of the sun and in the southern hemisphere azimuth is measured from the south. A line drawn on the chart at right angles to the sun's bearing through the position computed from the time sight is the line of position upon which the vessel is. The student should bear in mind that the vessel is somewhere on this line even if the latitude by dead reckoning from which the sight was worked be very considerably in error. Drawing the line of position as a straight line is an approximation sufficiently accurate for practical navigation. In reality the line is a small part of the circumference of a large circle whose center is the spot on the earth directly below the sun and upon whose entire circumference the sun has the same altitude. The combination of two lines of position can be best affected graphically in spite of the admittedly great drawbacks to using graphical methods at sea. The combination of the lines can be affected by calculation, but the computation is too long for the average small boat navigator.

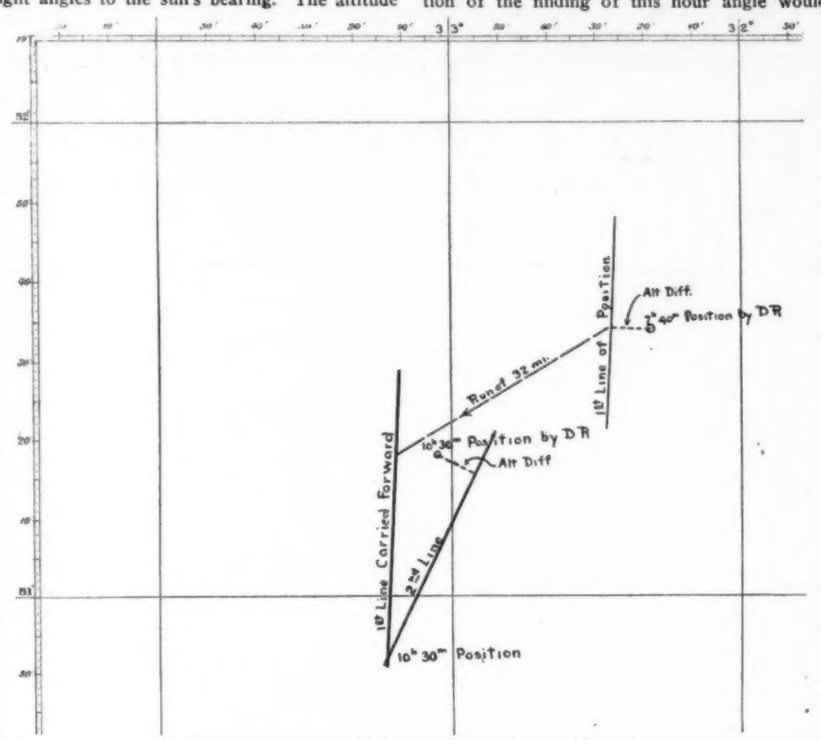
The location by Sumner's Method requires that two sights be taken and that the bearing of the sun shall have altered at least 25° or 30° between the taking of the sights. Both of the sights may be time sights or one a time sight and one a meridian altitude or ex-meridian. Naturally, if the ship were at rest between the taking of the sights the lines of position corresponding to the sights could be plotted on the chart and the ship would be at their intersection. The intersection is the only point lying on both lines and the sights show the vessel to be somewhere on both lines and consequently at their intersection. The practical problem occurring when the ship keeps running between the taking of the observations is almost as simple in theory and quite as simple in practice. In this case the first line of position is drawn as before and is then carried forward for the run between the first and second sights. The intersection of the second line of position with the first line as carried forward for the run is the position. The ship may be anywhere on the first line so to carry the line forward it is merely necessary to choose a point at random on the first line and lay of the run to the second sight from this point. A line drawn through the end of the line representing the run and parallel to the first line of position will be the first line carried forward. Many navigators never draw the first line in its real position, but compute the position from the first sight as in working a time sight for longitude, carry this position forward by dead reckoning to the second sight and draw through this position a line at right angles to the bearing of the sun when the first sight was taken. This line is the first line carried forward and its intersection with the line of position obtained from the second sight will be the vessel's position.

To save charts from the inevitable marking up brought about by working Sumner's Method on them, the Government publishes position line plotting sheets, which are sheets ruled with parallels of latitude and meridians of longitude, but upon which no soundings, shore lines and so forth are shown. These sheets are made for different latitudes, but no figures are shown on the meridians of longitude, so that they

may be used by the navigator to indicate any desired meridians.

The much used method of St. Hilaire, sometimes spoken of as the "New Navigation" or the method of the calculated altitude, is a short and accurate method of getting a line of position from a time sight. The principle of computation is absolutely different from that of the ordinary time sight and nothing but a line of position is obtained from the sight. The method of the calculated altitude is preferable to other methods of getting a line of position, because in the hands of an experienced calculator it is quicker and yields better results, especially with sights taken near noon when the other method fails more or less completely. The St. Hilaire method is spoken of as the method of the calculated altitude, because when using it the position by dead reckoning is taken as a basis of computation and the altitude at which the sun would have been had the ship been in this position is calculated. The calculated altitude is compared with the observed altitude and a correction is applied to the position by dead reckoning according to the following rule: Draw a line through the position by dead reckoning in the direction of the sun's bearing as taken from the azimuth tables. Plot a position on this line as many nautical miles from the position by dead reckoning as the observed altitude differs from the calculated altitude in minutes. If the observed altitude is greater than the calculated altitude lay off the altitude difference (the difference between the observed and calculated altitudes) towards the sun, if the observed altitude is less than the calculated altitude, lay off the altitude difference away from the sun. Through the newly plotted point draw the line of position at right angles to the sun's bearing. The altitude may be most readily calculated by the cosine-haversine formula. Detailed instruction for doing this work follow and an example accompanies the article.

From the position by dead reckoning and the watch time at which the sight was taken compute the local apparent time and look up the sun's azimuth in the azimuth tables. Find the log. haversine of the L.A.T. from table 45 and add to it the log. cosine of the latitude by dead reckoning and the log. cosine of the sun's declination the result being the log. haversine of a certain angle Theta. From the log. haversine of Theta find the natural haversine occurring alongside it in table 45, which will be the natural haversine of Theta. If the latitude and declination are of the same name **subtract** the lesser from the greater and if of different name add them, labeling the resulting angle L ~ d. Find the natural haversine of L ~ d and add it to the natural haversine of Theta, the result being the natural haversine of the zenith distance which is to be found from table 45. Subtracting the zenith distance from 90° gives the calculated altitude of the sun's center which is compared with the corrected observed altitude of the sun.



The method of St. Hilaire. Figure for problem 4

St. Hilaire's is perhaps the best all round process in existence for finding the position of a vessel at sea, for it can be applied to sights taken at any time of day no matter how near noon they may be; in fact, the St. Hilaire method reduces to the familiar meridian altitude formula if the sight be taken at local apparent noon when the L.A.T. will, of course, be 0h 0m 0s. The student should become thoroughly familiar with this method of ship location in spite of the fact that it is still looked upon with disfavor by great numbers of navigators in the merchant service. A still newer development in the science of position finding than the St. Hilaire method is the use of spherical traverse tables for the finding of lines of position. Hydrographic Office Publication Number 200 contains a reprint of the Spherical Traverse Tables published by Lieutenant Radler de Aquino of the Brazilian Navy in his book "The Newest Navigation." For those mathematically inclined, Aquino's Method has advantages over even the St. Hilaire, as it is probably quicker and has the same advantages of universal application and accuracy that the older method possesses. The Hydrographic Office publication referred to above contains compact and convenient logarithm tables for the solution of the spherical triangle for the line of position by the cosine haversine formula, and azimuth tables, as well as the Aquino tables and an explanation of their use. The azimuth tables are perhaps not so easy to use as those in Publication Number 71, which students have been advised to purchase.

St. Hilaire's and Aquino's methods are particularly useful for position finding at night by the use of stars. As has been said before, star sights are hard to take because of the difficulty attending the actual making of the observations, but very accurate determinations of the vessel's position may be made by them when several large stars whose azimuths differ considerably can be observed at the same time. In such a case, lines of position are obtained from each of the stars and the intersection of the lines is the position. As the observations are made at the same time, no carrying forward of the lines for run between observations is necessary. In practice three lines of position obtained from three stars will hardly ever intersect at a point, but will form a small triangle at whose center the vessel is probably located. The working of star sights is also more complicated than the working of sights of the sun, because of the confusion arising from sidereal or star time. Detailed instructions and rules of thumb will not be given here for the working out of star sights because it has been the writer's experience in teaching navigation that the rules are so seldom used that they do not become second nature to one as do the rules for working the common sun sights. The student who is anxious to become proficient in the taking and calculating of star sights is advised to study Chapter IX of Bowditch "Time and the Nautical Almanac" until the method of finding the hour angle of a star is really understood. When once this is mastered the star sight is mastered as the computation by the St. Hilaire method is done in the same way that a sun sight is done, except that the star's hour angle is substituted for the local apparent time. A discussion and explanation of the finding of this hour angle would necessarily be mathematical to a certain extent and could be nothing but a paraphrase of certain parts of Chapter IX. The student should, however, not let this statement frighten him away from the task of solving the star sight, for the finding of the star's hour angle involves only the addition and subtraction of angles.

Those who become really interested in navigation will doubtless wish to do some further reading on the subject and there is no book which the writer can recommend as unhesitatingly as Captain Lecky's Wrinkles in Practical Navigation. The book is first of all accurate and authoritative and is secondly perhaps the most readable technical book in the English language. The very great amount of practical experience that Captain Lecky could draw upon enabled him to illustrate each point as he took it up with an actual example of the process in question as he himself had used it at sea, and this in conjunction with his readable style makes the book a constant delight to the amateur navigator who loves the sea. The standard text-book of all American navigators is naturally Bowditch and the student should learn to use it in preference to all other texts and handbooks when a formula or method is to be looked up; as a reference book it is unequaled, though one would hardly read it with the pleasure with which one reads Lecky. The student is not advised to spend the comparatively large amount that copies of Lecky bring nowadays, but rather to get the book from a library and to stick to Bowditch as a practical handbook for use at sea.

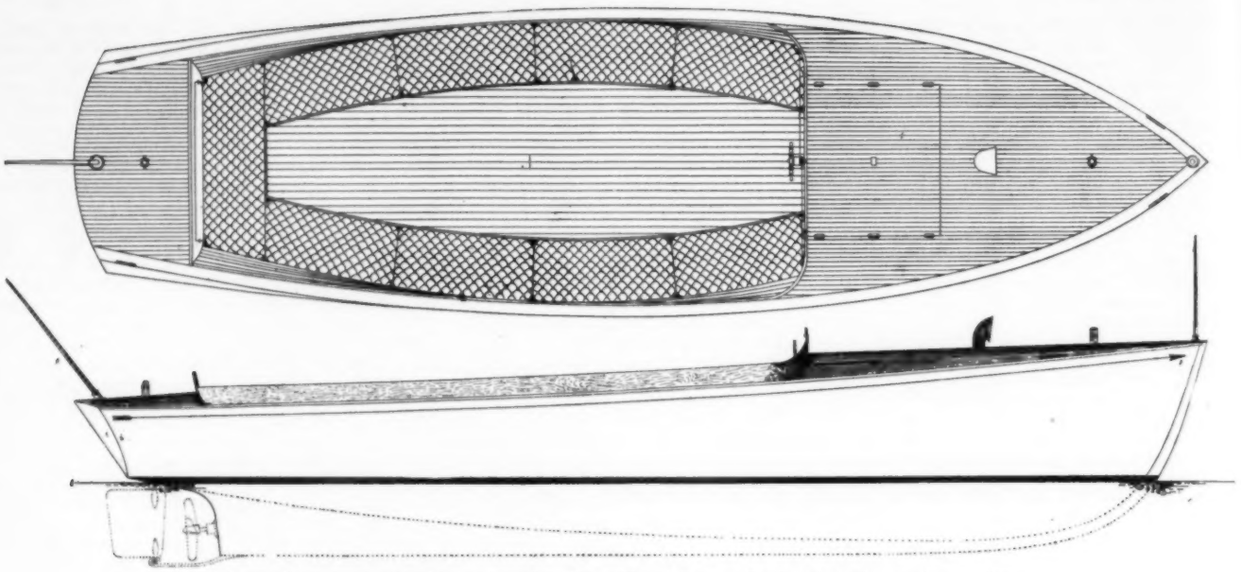
Problem 1. January 26, 1918, at 8h 20m a. m., took departure from Fire Island Lightship, Lat. 40° 28.5′ N, Long. 73° 11.1′ W, bearing 12° p.c. distant 8 miles the vessel heading 88° p.c. when departure was taken upon which course the deviation is 4° W. Patent log reading zero was put over when departure was taken and the course set 88° p.c. (Var. 10° W, Dev. 4° W). Held course until noon when the log read 43.0 and a meridian altitude of the sun was taken: Obs. alt. ☉ 30° 31′ 30″ Height of eye 12 ft., index correction — 1′ 30″.

Set course 90° and ran until 4h 00m p. m. when a time sight was taken the patent log reading 95.0 (Var. 11° W, Dev. 4° W). The data from time sight was as follows: Height of eye 12 ft., index corr. — 1′ 30″, C-W 5h 00m 05s, C.C. — 3m 18s.

W.T. 4h 0m 20s	Obs. Alt. ☉ 8° 19′ 30″
4h 0m 50s	8° 25′ 00″
4h 1m 23s	8° 30′ 30″

Find the noon and p. m. positions.

(*Continued on page* 58)



General arrangement plan and outboard profile of Zora. Scale: ¼ inch equals one foot

My Ideal Runabout

No. 3, Zora, a 28-Foot Round-Bottom Open Boat

By A. E. Redifer

THE principal object in view in designing this small craft was to produce an all-'round boat having plenty of room, stability, and cruising radius. Speed was a secondary consideration, and, in fact, did not enter into the design at all, so any one building from this design need not expect to win the cup or carry off any honors at the races, as the approximate speed under ordinary conditions will only be about 9 to 10 m.p.h., which is quite sufficient at the present, especially when gasoline and oil are at a premium, or will be in a short time. Besides it is the duty of every patriotic yachtsman and motor boatman to help conserve the fuel supply and to make his gasoline go as far as possible. Therefore, in order to obtain these results it will be necessary to use a low-powered motor, and in so doing we must sacrifice speed. In other words, it is not a case of how fast you can go, but how far without having to stop and fill up.

As the drawings are self-explanatory it will not be necessary to give a set of specifications, as everything necessary for the construction of the boat is marked, and the drawings are so arranged that they show the entire construction step by step from the time the keel is laid until the boat is finished, so I don't think anyone will have trouble in building. However, a general working description will do no harm.

Taking the line drawings first and referring to the table of offsets for dimensions, you will see that the boat has ample freeboard, medium high bow with slight flare, graceful sheer, and transom raking aft.

The waterlines aft of the midship section are good and full, and in fact they should be for a boat of this kind, especially when the stern is cut away, as it prevents squatting, a serious defect which causes no end of trouble and expense. However, by taking these things into consideration beforehand and combining them with my experiences, I believe this to be an ideal model for a small runabout that is to be used on the river and bay, as the boat has a generous displacement, good beam, moderate metacentric height, and an extra large cruising radius—four essential and very im-

My Ideal Runabout

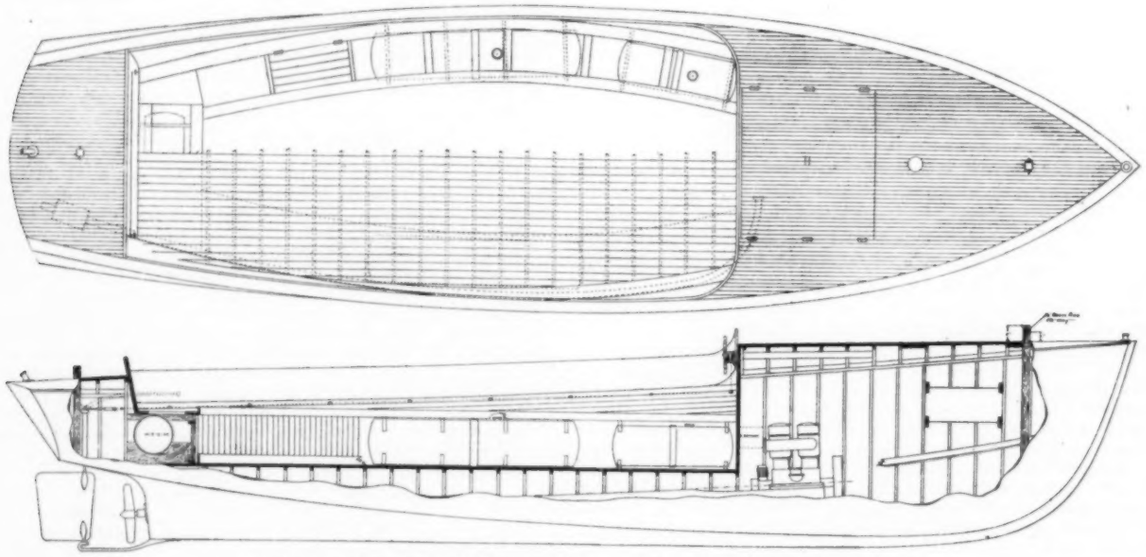
Zora, the third of the series of Ideal Runabouts, is a 28-footer that was designed with the idea of producing a small boat for general purposes that would be roomy, seaworthy and have a large cruising radius. As speed was not of primary importance the motor is of moderate power, which in turn gives economy of operation.

The Ideal Runabouts that are described each month will be only those designed by amateurs who know from their own experience what type of boat would be ideal for their individual requirements.

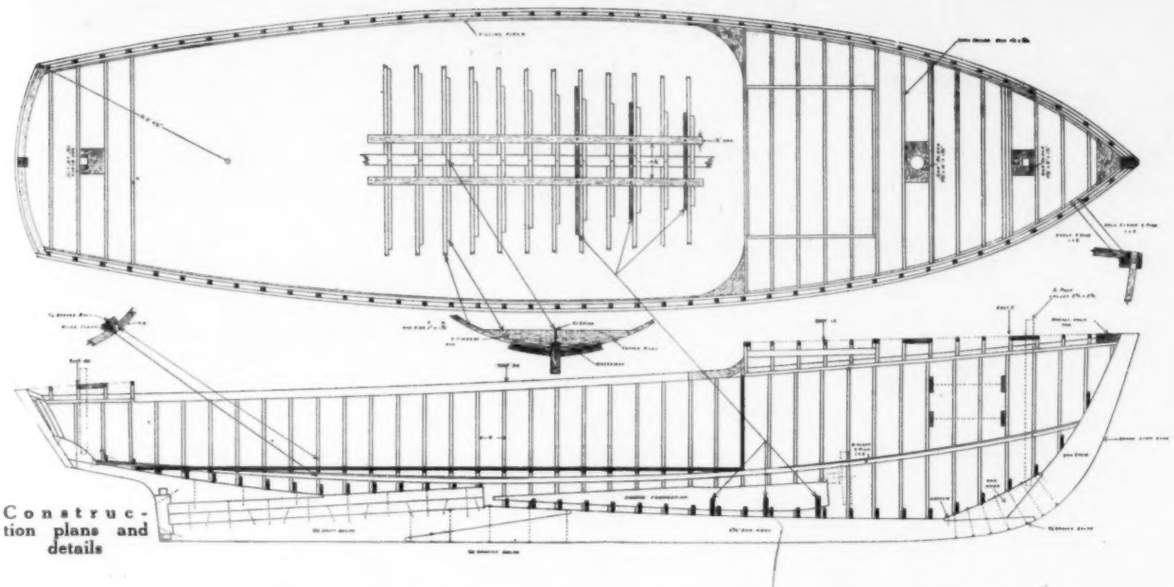
If you are an amateur who has some ideas on what would be your Ideal Runabout we should like to publish your plans and description.

For each set of plans published we will pay $35 in cash. At the end of the series a poll will be taken and every subscriber to MoToR BoatinG will have an opportunity to register his preference. The amateur designer whose boat received the greatest number of votes will receive a prize of $75 worth of boat equipment of his own selection.

All plans for this series must be submitted before May 16, 1918.



Sectional plans of the 28-foot runabout. Scale: ¼ inch equals one foot

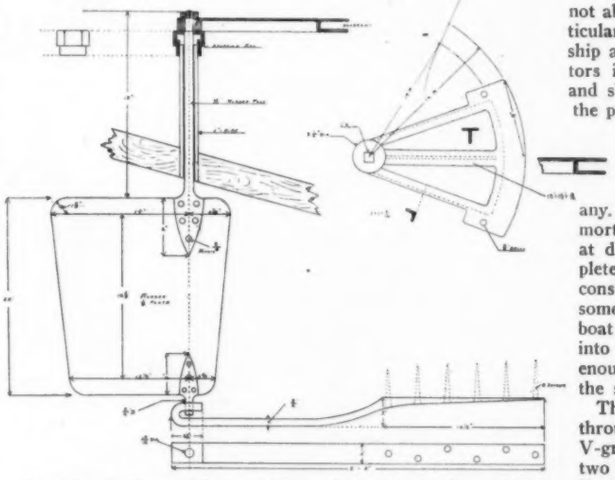


Construction plans and details

portant factors, and when combined should produce an all-round and dry boat for general purposes. However, that remains to be seen, but I hope to receive personally a full report of this boat's performance, both in regard to speed, stability, etc., from anyone who builds from this design.

The keel, which is the principal timber and upon which the longitudinal strength of the boat depends, will be of the best quality oak sided 2¾ inches, as well as the stem, knee, shaftlog horntimber and stern post. Ribs, white oak 1 by 1⅛ inches, mortised in keel and spaced 8 inches apart and clamped with yellow pine, which is about the best wood for this purpose as it has great strength and is cheap. Floor timbers oak, moulded, 3 inches, to be fastened as shown in drawing.

The deck beams are to be of oak and will rest on a yellow pine shelf notched at the ends (see detail sketch on drawing for particulars). While

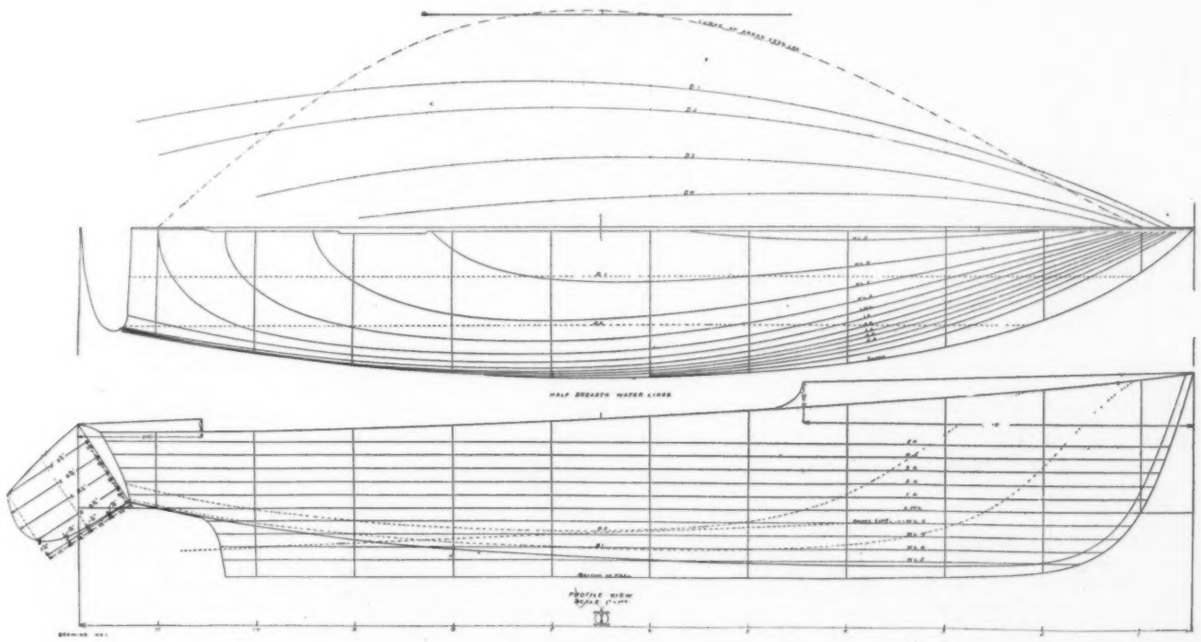


Details of the rudder, rudder tube, shoe and quadrant. Scale: ¾-inch equals 1 foot

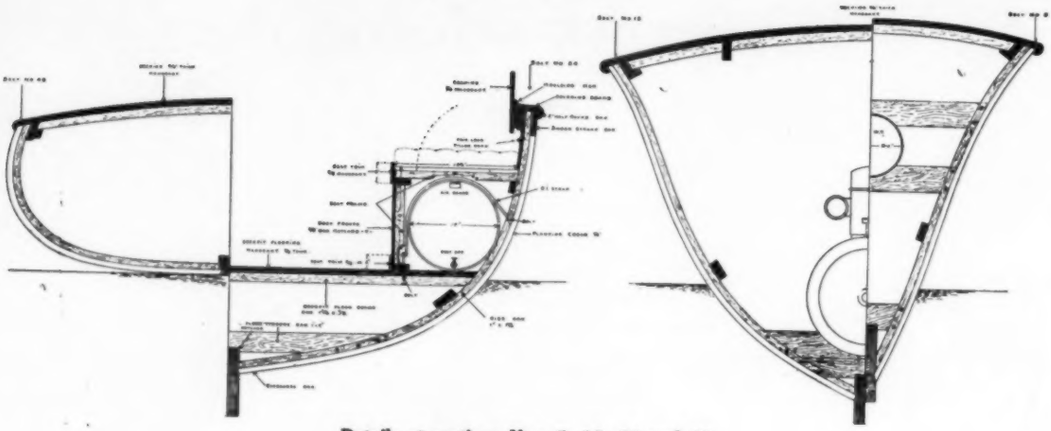
not absolutely necessary to be so particular, at the same time workmanship and strength are the prime factors in this design. The garboards and sheer strakes are oak, while for the planking we will use the old reliable cedar, as it is easy to work and gives excellent results.

The decking, covering board, and coaming are to be mahogany. Samson post to be of locust, mortised into the keel and reinforced at deck with oak block. This completes a general outline of the hull construction and it may appear to some readers rather heavy for a small boat; in fact, the materials entering into the hull construction are heavy enough for a small cruiser of about the same dimensions.

The inside finish is to be mahogany throughout, seat parts matched and V-grooved as well as bulkhead. The two center sections over the shaftline are to be removable and the back rest aft gives access to the quadrant,



Lines of the 28-foot runabout Zora

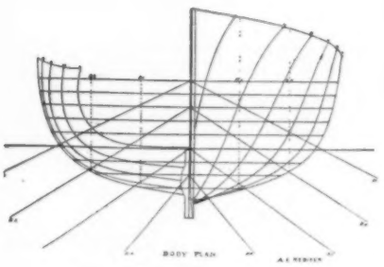


Details at sections Nos. 5, 12, 24 and 40

DATA SHEET

Length O. A.	28.25′	On L. W. L.	25′
Extreme Breadth	7.5′	On L. W. L.	6.41′
Extreme Draft	1.75′	To Rabet	1.25′
Least Freeboard	2.29′	Greatest	3.53′
Mean Draft			1.11′

Particulars	Weight	Volume	Area	Displacement	Co-Eff.	Remarks
Displacement	8536	86.5				
Block Co-Eff.					.48	
Pris Co-Eff.					.63	
L. W. L. Co-Eff.					.72	
Mid. Sec. Co-Eff.					.68	
M. I. Co-Eff.					.645	
Mid. Sec. Area			5.45			
L. W. L. Plane Area			117			
M. I. of L. W. L. Plane						297.5
C of B from No. 1 Ord.				13.27		
C of B Below L. W. L.				.494		
C of G from No. 1 Ord.				13.27		
C of G Above L. W. L.				.574		



Particulars	Weight	Volume	Area	Distance	Co-Eff.	Remarks
C of G of L. W. L. Plane				14.25		From No. 1 Ord.
C of L. B. from No. 1 Ord.				13.09		C. of L.B. .854 Below L. W. L.
Transverse M. C.				2.37		Above C of G
Long M. C. Height				41.		
Vol. of Above Body		234				By Formula
Vol. of Above Body		234				By Sections
C of Vol. from No. 6 Ord.				2		By Planes
C of Vol. Above L. W. L.				.875		
Area of Imm'd Surface			125.9			
Tankage						95 gal.
Cruising Radius						450 mi approx at 9 m.p.h.
R. M. at 20°						2929 Ft. Lbs.
Engine						14 h. p. Gray Mod T

so in case your steering gear gets jammed or goes out of commission you can ship your spare tiller and keep on going. This is one of the most important things to be considered and is often overlooked, but being a sailor by profession and not a designer is one of the reasons for giving this particular attention, as I have had the pleasure on several occasions while in the Pacific Mail line to fumble around in the dark, trying to ship the hand gear after the wheel chains had carried away. In making this statement I don't suppose we will make a voyage to China in this small craft, but the idea is to point out that the same conditions govern a small boat as well as a liner when it comes to being caught with your steering gear out of commission and your vessel being tossed around at the mercy of seas, in which case you want everything handy.

The tankage system will consist of two Jasco steel tanks 14 by 60 inches, one on each side, fitted with two swash plates 20 inches apart, also one extra Jasco tank (12 by 36 inches) located as shown on the drawing. The main system is to be connected up as one unit, and each tank to have a shut-off. (See drawing.) Also be sure to have your gasoline feed pipe equipped with the Underwriter safety fire valve, as it might save your boat some time.

The extra 15-gallon tank on the port side is to be connected up as a separate unit, and both main and extra tanks are to be under air pressure to insure a constant supply of gasoline when the tanks get low.

The drawing on page 36 shows one method of holding tanks in position by means of a cradle fastened with bolts, while the drawing on this page shows another method. I think the last method will prove more satisfactory than the first, as it makes a neater job and is stronger. However, on account of the extra large tankage the ribs and floor beams under the main system should be doubled, as there will be considerable strain in the ribs and planking in that vicinity when the boat is rolling.

In designing the tankage system it was not my intention to install a gasoline supply that would last all summer but enough to go and come home on, and a good many will appreciate this, especially the ones who have been caught and had to go ashore in some out-of-the-way place and hunt up gas; not taking into consideration the inconvenience, lost time, and the extra charge to motor boatmen.

At each end of the tanks there will be sufficient space for stowing gear, including supplies, clothing etc., while a small 10-gallon tank aft, dividable into two compartments, will serve the double purpose of a water tank and oil tank. This will come in handy when making extended cruises, especially when in salt water. The exhaust pipe should be carried along the side under the seat top and is to be covered with asbestos and fastened to every other rib with galvanized iron straps.

The power plant will consist of a 14 h.p. Model T Gray motor equipped with a Leece-Neville electric starter and air pump, so when ordering your engine have the builder put these extras on, as a job of this kind will give more satisfaction when done in a machine shop; besides, it saves time and trouble and your engine is ready to install when you receive it.

The storage battery is to be enclosed in a water-tight box, and fastened to the bulkhead (port side); see drawing. The propeller is to be a Columbian three-bladed wheel 18 inches in diameter. Steering wheel of brass, 12-inch bracket type. Cushions are to be of the life preserver type. Brass ventilator forward, and drip pans under both flywheel and carbureter, bilge pump, running lights, etc., form part of the equipment.

	HEIGHTS ABOVE BASE LINE			STEM MEASURES AFT VERTICAL LINE			STERN MEAS AFT °10 ORD
ORD	SHEER	RABET	B of KEEL	W.L.°	FRONT OF STEM	RABET	STERN POST MORTISED FOR TRANSOM
Sheer	6-6-0						
1	6-4-0	3-6-0	2-11-7	Stem	0-0-0	0-0-2	4-4-2
2	6-0-7	1-8-2	1-5-2	5A	0-7-3	0-10-3	4-2-2
3	5-10-4	1-7-1	1-3-4	4A	0-8-7	1-0-0	3-11-4
4	5-8-2	1-7-0	1-3-0	3A	0-10-4	1-1-5	3-8-6
5	5-6-0	1-7-4	1-2-7	2A	1-0-2	1-3-4	3-6-0
6	5-4-1	1-8-3	1-2-6	1A	1-2-2	1-5-5	3-3-4
7	5-2-4	1-9-4	1-2-6	LWL	1-4-2	1-7-7	2-6-0
8	5-1-2	1-11-3	1-2-6	WL 2	1-7-0	1-10-6	1-2-4
9	5-0-2	2-2-0	1-2-6	WL 3	1-10-3	2-3-0	0-11-4
10	4-11-4	2-6-1	1-2-6	WL 4	2-3-4	2-9-6	0-10-4
11	4-11-0	3-0-2	3-0-0	WL 5	2-10-6		0-9-7
T	4-10-7	3-1-6	3-1-5				0-9-2

Information: No 1 ORD is 1-4-4 aft Bow Vertical. Ordinates 2-6-0 apart. Transom is 1-9-6 aft °1 ord at sheer. LWL is 3-0-0 above base line. W L and 0-4-0 apart.

HALF BREADTHS

	ORD°1	°2	°3	°4	°5	°6	°7	°8	°9	°10	°11	T
Sheer	1-1-3	2-4-1	3-0-4	3-5-3	3-8-3	3-8-4	3-8-7	3-8-4	3-5-5	3-1-0	2-8-4	
5A	0-6-6	1-5-4	2-4-4	3-0-3	3-5-4	3-6-4	3-6-4	3-6-3	3-4-2	3-1-4	2-9-2	
4A	0-3-5	1-4-0	2-2-5	2-10-7	3-4-4	3-6-0	3-6-0	3-6-0	3-4-2	3-2-2	2-9-4	
3A	0-2-6	1-2-4	2-0-7	2-9-4	3-3-4	3-7-0	3-8-1	3-7-4	3-5-7	3-3-1	2-9-2	
2A	0-1-7	1-0-6	1-10-7	2-7-5	3-2-0	3-5-4	3-7-0	3-6-4	3-4-7	3-1-6	2-8-0	
1A	0-1-0	0-11-1	1-8-5	2-5-2	3-0-0	3-4-0	3-5-2	3-4-4	3-3-0	2-10-7	2-4-6	
LWL	0-0-0	0-9-3	1-6-2	2-2-5	2-9-2	3-1-4	3-2-6	3-2-2	3-0-6	2-7-2		
WL2		0-7-4	1-3-5	1-11-1	2-5-4	2-9-3	2-10-6	2-9-7	2-6-2	1-6-3		
WL3		0-5-5	1-0-4	1-6-5	1-11-5	2-3-6	2-4-4	2-2-4	1-5-0			
WL4		0-3-4	0-8-2	1-0-2	1-2-4	1-4-4	1-4-0	0-6-2				
WL5		0-1-3	0-3-1	0-4-6	0-3-7							
RBT	0-1-3	0-1-3	0-1-3	0-1-3	0-1-3	0-1-3	0-1-3	0-1-3	0-1-3	0-1-3	0-1-3	0-1-3
Rail	0-0-3	0-0-7	0-1-3	0-1-3	0-1-3	0-1-3	0-1-3	0-1-3	0-1-3	0-1-3	0-0-4	

Lines To Outside of Planking. Planking ⅞. And Top of Sheer. Decking ¾.

		WIDTH FROM CENTRE		DIAGONALS			MEASURES AND OUT FROM CENTRE	
ORD°	D1	D2	D3	D4	DIA		UP FROM BASE	OUT FROM CENTRE
1	1-6-6	0-2-6			1		4-8-1	3-2-4
2	1-6-4	1-1-5	0-8-5	0-5-2	2		3-9-6	6-4-6
3	2-2-0	1-10-0	1-2-5	0-8-0	3		2-11-6	4-2-4
4	2-9-4	2-6-4	1-6-1	0-9-2	4		2-3-7	1-10-4
5	3-3-2	2-9-0	1-7-6	0-9-2				
6	3-6-6	2-11-2	1-8-6	0-8-6				
7	3-7-7	3-0-6	1-8-4	0-7-4				
8	3-7-2	2-11-1	1-6-5	0-5-5				
9	3-5-4	2-8-5	1-2-6	0-4-2				
10	3-2-2	2-6-4	0-9-0	"				
11	2-9-1	1-9-3	0-6-0					

Table of offsets and dimensions of other principal parts

New Things for Motor Boatmen

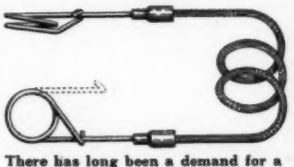
[Each month new parts, attachments and fittings, interesting and invaluable to owners of large and small motor boats, are added to the devices already on the market. Announcements of these articles come to us in such numbers that in order to introduce all of them to our readers we have been obliged to omit descriptions and publish only illustrations with short explanatory captions. In doing this, however, we urgently invite our readers to write us for complete information, as we shall take the greatest pleasure in providing it, together with the manufacturers' names and addresses. Do not hesitate to ask us, as we have made special arrangements to take care of this branch of our correspondence and are able to give you accurate information with the greatest promptness.]

Monarch special carbureter, offered this year for the first time, has all the features possessed by the Monarch Standard, and in addition thereto important improvements designed to give greater ease in starting, obviating necessity of priming, and increased speed flexibility, and whenever needed very much more power to the engine, and resulting in a faster boat

Flexible magneto coupling, which is made in sizes from 2 to 3¼ inches in diameter and from 3/16 to 5/16 of an inch thick

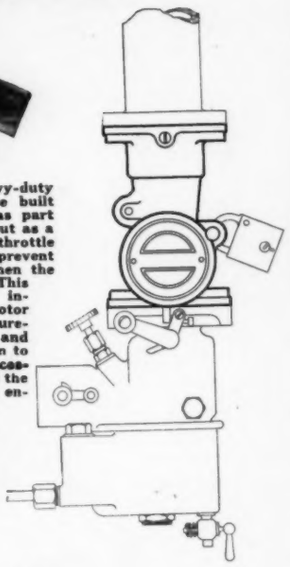
It is claimed that this Model K carbureter is powerful and economical on two-cycle and four-cycle marine motors. Its safety feature is invaluable in marine use

An electric cooker for the motor boat that can be operated on a storage battery lighting system of 30 volts or more. The current used is less than 1½ amperes per hour



There has long been a demand for a battery clip to grip the various and odd-shaped terminals used on storage batteries. Here is a battery clip that in one way or another can be made to hold—and make good electrical contact—on any terminal

Some of the heavy-duty marine motors are built with a governor as part of the equipment but as a general rule the throttle must be closed to prevent a motor racing when the clutch is out. This governor can be installed on any motor between the carbureter and manifold, and no other connection to the motor is necessary. The action of the governor depends entirely upon the velocity of the gas through it and is controlled by a spring. The adjustment can be locked to prevent tampering with it



A new and improved rectifier for use in charging storage batteries from an alternating current circuit. Made in three sizes with capacities of 2 and 6 amperes for charging from one to thirty cells at one time

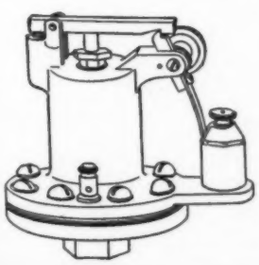
This wrench is intended to be used when tightening up grease cups, to reach into inaccessible places to open drain cocks or to open or close relief cocks when hot. It is of simple construction and does not require adjustment

A wrench specially designed for working in cramped or inaccessible locations. The angle of the head with the handle is adjustable and can be changed by pressing the button shown on the under side of the handle

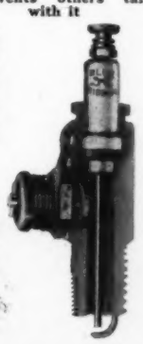
The use of a priming system on large marine motors with electric starters is practically a necessity. This priming pump is especially designed for mounting on the bulkhead or instrument board. The system includes an auxiliary tank to contain high test gasoline which gives much better results for priming and starting a cold motor than the low grade fuel now in general use

Most every motor boatman has at some time run out of gasoline. Here is a valve that will assure a reserve supply being maintained in the main tank. The gasoline is drawn through the tube at the top, and should the supply not be sufficient to cover the tube the valve is unlocked and the reserve supply drawn upon. A drain is provided in this valve for drawing gasoline or emptying the tank. A padlock put on the valve by the boat owner prevents others tampering with it

A first-aid kit containing everything necessary to treat minor injuries and to relieve the more serious cases until medical assistance can be obtained. This kit should prove especially valuable aboard boats on long cruises offshore or through the less densely populated districts



An automatic circuit breaker operated by pressure. It is designed to break the ignition circuit of a gasoline motor driving an air or water pump when a predetermined pressure is reached



A real novelty in spark plugs. An adjustable auxiliary air valve is built into the side of the shell. The air not only reduces the gasoline consumption, but cools the shell and electrodes of the plug. It is also claimed that the air entering the shell of the plug prevents carbon deposits or fouling by oil

Do not fail to write to the editor if you desire information concerning any of the above new things

Helpful Hints for the Motor Boatman

It is MoToR BoatinG's *purpose to publish every month under this heading such methods and "kinks" as motor boatmen have found helpful to them in their enjoyment of the best of all sports. The subjects will not be restricted to any particular phase of boating but will be as varied as we, with the help of our readers, can make them. To help make this page a success we want our readers to send us short accounts of the little things that have helped them out of their difficulties or stopped the little annoyances that seem bound to occur every so often.*—EDITOR.

Some Helpful Don'ts

When overhauling the boat in the spring, or even when making repairs during the summer, don't start everything at once unless you want to take the longest possible time for the work.

It makes little difference whether the work on the boat or the motor is started—and finished—first, but don't start both at the same time or the result will be something similar to the condition of affairs shown in the illustration. Had the locker and seats been left intact there would have been a place to stow away the boat-hook, rope, cans of paint and other gear when working on the motor.

As it is, the reverse gear case is thrown back out of the way—where it will collect dirt and grit to help make the clutch hold. The nuts, bolts, and other small parts from the engine are laying around, mixed up with the tools so that they are almost sure to be lost in the bilge. A miscellaneous lot of junk is mixed up with the engine parts and tools just to make it harder to find the particular piece you are looking for. The two cans of paint are left just where small parts can fall into them, or are liable to be kicked over, making a mess of things, to say nothing of the loss of paint at the present high price.

A fine example of how not to overhaul your motor. Start one thing—and finish it—before tackling something else. Don't start on your motor, rebuilding your boat, and the painting all at once

Don't start to dismantle your motor by removing the larger parts first. Always remove the spark plugs, priming cups, air pump, timer and small parts first. It will save them from damage when moving the larger parts. In this particular case the air pipe on the port side of the motor, directly over the paint cans, shows by the kinks and flat spots the results obtained by the "system" used aboard this boat.

Don't go at your engine with a hammer and cold chisel as if you were chipping gates and risers from a casting. You spoil the surface and may crack a casting. If the parts will not separate easily, tap them lightly on all sides with a hammer, and if necessary pry them apart at the same time with a screwdriver.

Don't use your largest wrenches on the smaller nuts and bolts—they are easily broken—and don't use a pipe wrench on anything but pipe. There is nothing that makes the engine work more difficult, or more trying on a person's temper, than to try and "slack off" nuts that have had the corners chewed off by the use of a pipe wrench.

Don't—and this is probably the most important of all—don't put the carbureter down in a hole under the floor, in a locker or any other out-of-the-way place. It would be hard to imagine a worse or more dangerous carbureter installation than the one shown in this boat. Any drip or leak from the carbureter would go into the bilge, fill the space under the floor with gasoline vapor without being noticeable to those aboard, and the first backfire would be almost sure to start a fire, if not an explosion of the gas under the floor.

That Carbon Jinx Again

We all know that the carbon deposited in our engine cylinders can be removed by the oxygen method of burning out, but there seems to be a lack of information in many cases as to just what the process is. It is nothing but the consumption of this deposit by a flame which has enough excess oxygen to entirely consume the carbon.

In a less marked degree anyone can eliminate this carbon for himself at the outlay of not over fifty cents, and what is even better, can run his engine throughout the season with absolutely no trouble from the carbon jinx if he will spend fifteen minutes of his time a week.

Between the carbureter butterfly valve and the motor, tap into the inlet pipe with a ⅛-inch pipe tap and into this hole screw a petcock of the ⅛-inch size. This and about three feet of rubber tube is all the apparatus required.

To use, run the motor till it is good and hot, connect the tube to the petcock, which is normally kept closed, open the petcock and drop the free end of the tube into a pail of fresh water. The motor should be kept turning over at a good rate of speed, and if there is a tendency to stall remove the end of the tube from the water and let the motor speed up, then repeat the process till the water has been used up. A motor that has been cleaned out at the first of the season can be kept free from carbon by this process and a carbonized engine can be cleaned out by repeating the process a few times.

The explanation is simple. The water carried into the hot cylinders is decomposed by the heat of the explosion and resolved into its two component gases. The excess of oxygen thus liberated tends to help in the burning of the carbon and freeing it from the cylinder and piston, enabling that part that is not consumed to pass out through the exhaust.

Preserving the Muffler and Exhaust Line

When a boat is used in salt water, the exhaust pipe as a rule has to be renewed about every three years, and in boats where it is exposed to the weather its life is even shorter. Of course, the most satisfactory material for this purpose is copper pipe, but the scarcity of the material and the extreme high cost at the present time practically eliminates its use, so we must make the best of what we have.

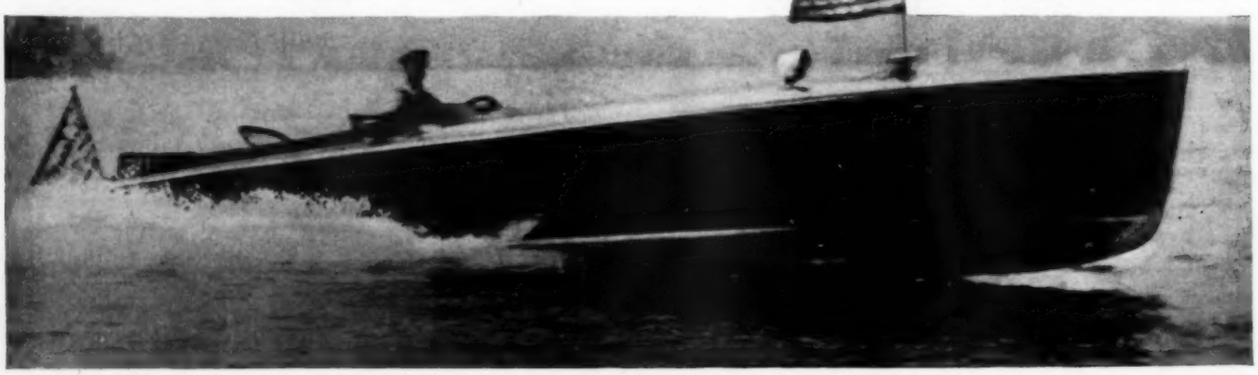
In installations where the cooling water is discharged into the exhaust line galvanized pipe will undoubtedly give the best service, but should the entire line or any part of it be "dry," extra heavy black wrought iron pipe will prove as satisfactory as galvanized, as no galvanizing will stand up under heat.

The useful life of black iron pipe can be lengthened by painting it with graphite smokestack paint. This is a product that will give good service and provide protection from the weather even when the temperature of the metal is so high that ordinary paint would be burnt off.

When galvanized pipe is used the first place attacked by rust is the threads. This condition can be helped to some extent by using graphite paint on the threads before making up the pipe joints, and after the line is made up give the exposed threads a good coat of the paint.

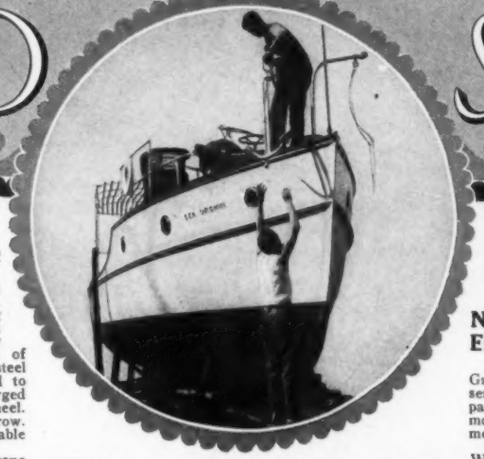
Most mufflers are cast iron and not seriously affected by moisture, but a coat of graphite paint will prevent rust collecting on the surface, which is unsightly and apt to rub off on anything that comes in contact with it.

Mufflers that are made up of cast iron headers with sheet iron body and baffles will not last long when the cooling water is run through them, especially when salt water is used.



Mary Bell, a 28-foot runabout designed by John L. Hacker, of Detroit, and powered with 100 h.p. Sterling motor

YARD AND SHOP



Harris Kerosene Motors

The Harris Engine Co., of Wilmington, Del., have just issued a new catalog describing their four cycle kerosene motors.

These motors are heavily constructed to stand up and give real service under all conditions. They are built with T-head cylinders, all moving parts enclosed and the reverse gear enclosed in an extension of the base. The cylinders, cylinder heads and base are cast from the best grade of gray iron. The crankshaft is a chrome-nickel steel forging, heat treated and bearing surfaces ground to exact size. The forward end has a flange, forged integral with the shaft, for attaching the flywheel. A bearing is provided between each crank throw. The connecting rods are steel forgings with adjustable phosphor bronze boxes at both ends.

Probably the most notable feature is the kerosene vaporizing device. This is built into the exhaust manifold and consists of a number of tubes through which the exhaust gases pass. The incoming charge of gas from the carbureter passes around these tubes and is heated to such a temperature that the kerosene is thoroughly broken up and vaporized.

Even when idling, with the clutch thrown out, the mixture is heated to a temperature of 250 degrees F., assuring thorough vaporizing of the kerosene, assuring flexibility of operation and avoiding any chance for condensed kerosene to accumulate in the manifold with the result that the motor can be immediately thrown into full power and speed without danger of choking or a single miss in the cylinders.

The Harris system does not depend upon a carbureter to vaporize the kerosene. The heat from the exhaust gases accomplish this in the gas generator, built into the manifold, with the result that the exhaust is always clear and odorless, and the thorough vaporization of the fuel prevents carbon formation in the cylinders. These motors are started on gasoline in the same manner as an ordinary motor, but when warmed up the fuel is changed to kerosene. The ignition is by means of a high-tension jump spark with non-vibrating coil and distributor, and is automatically controlled by a centrifugal governor so that under no conditions can the spark be advanced too far.

Mr. Mutchler Enlists in the Service of Uncle Sam

It has recently been brought to our attention that M. E. Mutchler, who has been acting faithfully and successfully in the capacity of advertising manager of the Sterling Engine Co., of Buffalo, N. Y., has enlisted and has been duly sworn into the service of Uncle Sam, as chief storekeeper with a rank of chief petty officer in the Navy. He is now awaiting orders from the Great Lakes.

Mr. Mutchler states that it is with much regret that he leaves the employ of the Sterling Engine Company, as his work there for the last several years has been very agreeable, and there is a satisfaction, however, in knowing that one is healthy and husky and able to get out and do his bit. The rank assigned to Mr. Mutchler is the highest non-commissioned rank available at the present time, as commissions are prohibited, but by constant application it is expected that he will raise himself in the Navy just as he had done in the business field.

Mr. Mutchler's position will shortly be taken by Mr. Payne, recruited from the Pierce-Arrow advertising department.

Shamrock, a Real Quality Runabout

The 25-foot runabout shown in one of the accompanying illustrations is a production of the Everett-Hunter Boat Co., of McHenry, Ill. The general construction of this runabout is standard, having white oak frames and white cedar planking, the interior finish is in mahogany.

The top is something new in the Everett-Hunter line, and it has been reported by all of its users to have given the very best satisfaction. The windshield and storm curtains, attached to the top, makes it a nice little runabout with plenty of protection for the passengers in a rainstorm.

The power plant is a Model D-4 20-24 h.p. Gray motor, equipped with an electric starting and lighting system. A 16-inch three-bladed speed propeller which turns from 900 to 950 r.p.m. forms part of the equipment. The motor is installed under the hood forward, and with full automobile steering wheel and control, there is comfortable accommodations for eight persons. With this sturdy little power installation the runabout makes a speed of 18 m.p.h.

The New Flechter Carbureter

The Flechter carbureter as manufactured by L. V. Flechter & Co., of 192-200 Jackson Ave., Long Island City, N. Y., combines simplicity of construction, unusual fuel economy, with reliability of operation. All complicated gasoline adjustments that can only be handled by an expert have been entirely eliminated. These features will make a strong appeal to the engine builder and the boat owner.

In the Flechter construction a fixed nozzle or spray is employed. The orifice of this jet is calculated for the size of the carbureter and type of motor on which it is to be operated, and the only adjustments necessary being to the air supply. Flechter carbureters are manufactured in single- and double-jet types, adjustments being provided for high and low speeds. Both act directly on the amount of air admitted. These adjustments are placed on top of the carbureter where they are directly accessible, and as they lock at any point they are set, are not affected by vibration or jolting. The necessity of tools is also eliminated in making speed adjustments, these being plainly marked so that they can be turned to produce correct results without experimenting.

The fuel jets employed in the Flechter carbureters are of the atomizing spray type. The suction from the motor draws the gasoline through the opening in the form of a fine mist. The body of the carbureter is a bronze casting, an annular type of float being installed, made of spun brass and copper plated. The throttle valve is of oval section with beveled edges, so that the fuel supply can be regulated at will.

The new Liberty drive 2 h.p. outboard motor recently put on the market by the Caille Perfection Motor Co. of Detroit, Mich.

Instead of the usual set screws and stops ordinarily provided for limiting the opening of the throttle lever, two small screws are tapped into the lever arm itself. To provide quick and sensitive response to the throttle when accelerating, the auxiliary air valve is of unusually liberal diameter.

Control of the amount of air admitted by the auxiliary air valve is effected by increasing or decreasing the compression of the low-speed and the high-speed springs, which constitute absolutely the only adjustments on Flechter carbureters. Both of these are placed concentrically on top of the auxiliary air valve. The adjustments can be made without the use of tools and lock wherever placed.

A Model D Gray Installation

On the following page is shown an attractive 28-footer with a beam of 5 feet owned by Charles Trezona, of Ely, Minn., and is powered with a 20-24 Model D. Gray motor, which is making better than 10 miles an hour, with a dozen happy-faced girls and a sober-faced pilot, Mr. Trezona.

Mr. Trezona writes us that the Model D engine is the smoothest and most quiet running power plant he has ever had, and he has had many. It is claimed that owing to the fact that the motor starts so easily that several of the girls start and operate it without any trouble whatsoever.

New Representatives for Emil Grossman

L. V. Hansen has associated himself with Emil Grossman Mfg. Corp., of Brooklyn, N. Y., to represent the Grossman line among the manufacturers of passenger cars, motor trucks, gas engines, aeroplanes, motor boats, etc., for the purpose of obtaining equipment contracts for Red Head spark plugs.

They have also engaged the services of Charles Weinberg, who will act as a detail representative to popularize to a greater extent than ever Red Head spark plugs and Ever-Good motor accessories in the states of Texas, Arkansas, and Oklahoma.

Sydney S. Frank has also joined the force of Emil Grossman corporation for the purpose of representing their line among the export trade in New York City and other Atlantic ports. Mr. Frank was formerly connected with the American Motors, Inc.

Dayton Electrical Mfg. Co. Reorganized

The Dayton Electrical Mfg. Co., of Dayton, O., has been reorganized and moved into their new factory. Under the new management, the following officers will be in charge: H. G. Catrow, president; Vincent G. Apple, vice-president and general manager, and W. V. Knoll, secretary and treasurer.

They will manufacture a full line of low voltage dynamo-floating storage battery systems for motor boats consisting of six different sizes of ignition and lighting outfits. The four and eight-light outfits will be six-volt systems, so that a powerful incandescent searchlight can be operated.

These outfits will be of the latest improved design for boats ranging from 16 to 100 feet in length. They will include every piece of apparatus needed for a complete lighting system with the exception of the lights themselves and the wiring.

The generator is of the enclosed type with either friction or belt drive but both provided with a centrifugal governor to overcome any tendency to overheat as a result of being run at too high a speed.

The automatic cut-out eliminates the chances of having the battery discharge back through the generator should the switch be left in after the engine is stopped.

A volt-ammeter and rotary snap switch mounted on the front of the cut-out housing replaces the usual large switchboard. The generator, battery and instrument circuits are all controlled by the same switch.

Van Blerck Move to New Quarters in New York

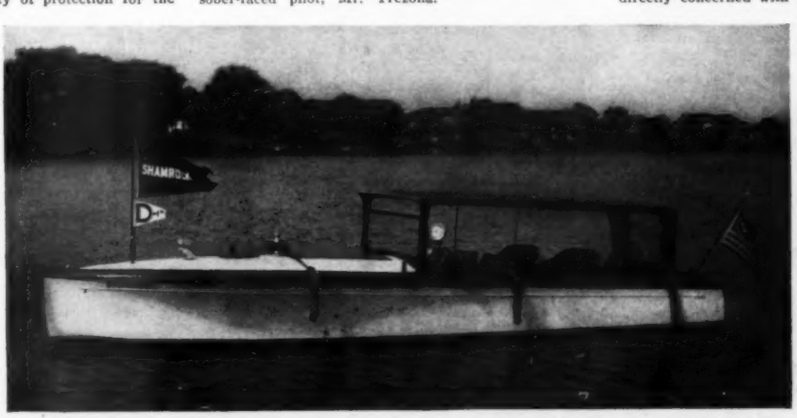
Effective May 1st, the address of the executive offices of the sales and service department of the Van Blerck Motor Co. will be 30 Church St., New York City. The principal reason for making this move is to obtain more space as the business of the company has increased to such an extent that larger quarters are absolutely necessary.

The new offices at 30 Church St. are located on the fourth floor and occupy rooms 419 to 427 inclusive. A complete stock of Van Blerck motor repair parts valued in excess of $25,000 will be carried in stock in addition to which a large display room is provided where the current models of the Van Blerck engines are exhibited to good advantage, enabling prospective purchasers to actually see the motors and look them over at close quarters.

All correspondence, inquiries, etc., pertaining to sales or service of the Van Blerck Motor Co., should be addressed to the new executive offices, 30 Church St., New York City. Only correspondence directly concerned with factory matters should be addressed to the factory at Monroe, Mich.

F. B. Sexton, the sales manager of the Van Blerck Motor company, in announcing the change of address particularly emphasized the fact that the new executive offices will allow the Van Blerck Motor company to render an even more prompt and efficient service to both old and new purchasers than in the past. He extends on behalf of the company a cordial invitation to all readers of this magazine to visit the new offices and look over the new Model M Van Blerck which caused so much comment and interest at the recent New York Motor Boat Show.

Mr. Sexton also announced that the Van Blerck Motor company has recently appointed the Pacific Net & Twine Co., Pier No. 8, Seattle, Wash., as exclusive dealers for Washington and Alaska. This concern is one of the



A 25-foot runabout built by the Everett-Hunter Boat Co., of McHenry, Ill. The cover is a new design, following somewhat after the permanent tops now coming into use on automobiles

biggest engine and accessory dealers on the Pacific Coast, and now carries a complete line of Van Blerck engines on their floor in their Seattle show room.

Vanity Fair, a 36-Foot Runabout

One of the smartest runabouts on the St. Lawrence River during the last season was the Vanity Fair, owned by Roland Comstock and operated in the Thousand Islands district.

Vanity Fair is modern to the last detail and is powered with a 32-40 h.p. Model B Red Wing Thorobred motor, which produced a speed of 17 m.p.h. She was built by Hutchinson Bros., the well-known builders of Alexandria Bay, N. Y., who use many Thorobred motors in their installations.

This boat is 36 feet long with a beam of 6 feet 6 inches, from which dimensions her room and comfort may be judged. Hutchinson Bros. have built many charter runabouts of this type during the last season, many of which have done as well or better than Vanity Fair with their Red Wing Thorobred power plants.

An attractive 26-foot runabout, owned by Charles Trezona of Ely, Minn., and driven at a speed better than 10 m.p.h. with a 20-24 h.p. Model D Gray motor

The Liberty Drive Outboard Motor

The Caille Perfection Motor Co., of Detroit, Mich., have just placed on the market an entirely new type of outboard motor that has a direct drive—no bevel gears or other parts to wear, get out of order or absorb power.

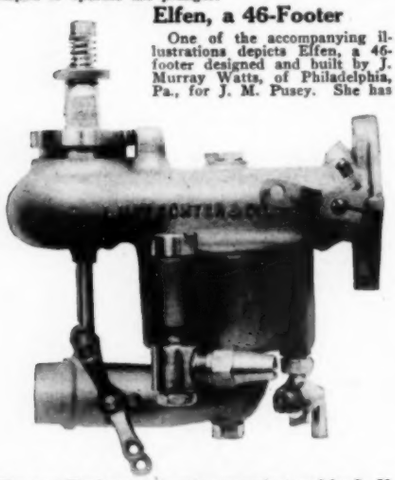
The motor is secured to the boat by clamps in the usual way, but aside from this it is entirely different from other outboard motors. The fuel tank is detachable, and can be filled at home. When in use it is securely attached to the motor.

The complete battery ignition system is enclosed in a water-proof case mounted directly under the fuel tank. The wheel is a two-bladed weedless type, and as the motor is mounted on a Universal joint bearing, it can be run in very shallow water or through dense growths of weeds—in fact, any place that there is enough water to float the boat. Steering is accomplished by turning the entire motor on the universal bearing by means of the tiller.

The motor has a bore of 2¼ inches and a stroke of 2½ inches, developing 2 h.p. at 800 r.p.m. Lubrication is by means of mixing oil with the gasoline and grease cups on the main bearings. The plunger pump for the cooling system is located just ahead of the propeller, the hub being shaped to operate the plunger.

Elfen, a 46-Footer

One of the accompanying illustrations depicts Elfen, a 46-footer designed and built by J. Murray Watts, of Philadelphia, Pa., for J. M. Pusey. She has a wide beam of 11 feet 6 inches and a draft of 3 feet 6 inches with full headroom.



The new Flechter carbureter manufactured by L. V. Flechter & Co., of Long Island City has many features which should appeal to the engine manufacturer and motor boat owner

Elfen is powered with a six-cylinder Frisbie motor having bore and stroke dimensions of 6 x 6 inches. This power plant is equipped with two ignition systems, an Atwater-Kent and Bosch electric generating and starting system. The craft is electrically lighted throughout, having cabin searchlight, binnacle, running, and anchor lights.

Two 50-gallon gasoline tanks are located aft of the engine-room, and one 65-gallon water tank is located forward. All controls are brought to the bridge deck forward for one-man operation.

The general layout of the sleeping quarters afford accommodations for seven persons, not including the owner's stateroom, which is outfitted in the latest modern fashion.

Elfen is completely equipped with tender, anchors, life preserver cushions, etc. Her owner, J. M. Pussey, who has successfully used this craft since 1915, is now offering her for sale at $6,000.

Something New In Searchlights

An automobile would be of little pleasure and scarcely safe without electric headlights. The pleasure and safety of your boat can be increased as much with the new Delta boat searchlights manufactured by the Delta Electric Co., of Marion, Ind.

If your boat is equipped with a storage battery you will want the new powerful No. 12 searchlight, manufactured by the Delta company, which will throw a light over 1,000 feet. It will fit any kind of a boat on account of the adjustable height. The focus can be instantly changed from a wide angle beam to a powerful penetrating shaft which will show up objects for over a quarter of a mile.

The Delta No. 12 lamp can be operated on dry batteries if so desired.

Every kind of motor boat, rowboat or canoe should be equipped with a Delta searchlight. The Model 5 lamp can be used on any craft. It operates on two common dry batteries and will throw a light from 500 to 1,000 feet on water, and can be instantly detached. The battery case is portable for trouble or general utility lamp.

The Cell-Beam searchlight. A device that can be used as a searchlight, spot light or trouble lamp

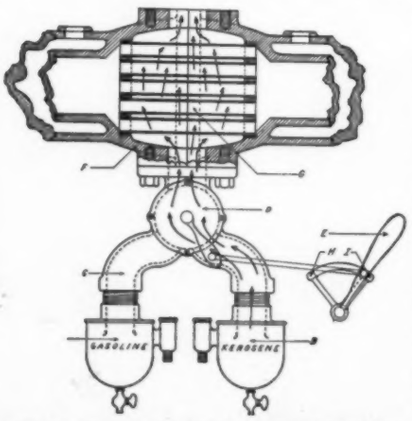
Cell-Beam Concealed Searchlight

This compact electric searchlight is an exceptionally powerful projector of both spot and diffusive illumination. The concentrated beam of projected light extends 500 feet, while the objects close at hand are illuminated by a diffusive glow of indirect and transmitted light, devoid of the annoying direct filament glare.

As a light accessory of style and convenience, strictly complying with the law, pertaining to the utmost in safety, the Cell-Beam searchlight represents the newest optical development.

This latest development in optical science provides not only a powerful main beam, but a non-glare general illumination as well. Furthermore, it is no longer necessary to clamp the projector to the windshield, the dimensions of the new Cell-Beam searchlight being such that it can be attached with a clip to the instrument board or any other convenient point around the boat.

The Cell-Beam searchlight uses a 30 c.p. bulb, weighs less than a pound and is claimed to be more powerful than the ordinary windshield spot light, yet has many more uses beyond that of a spot light, is finished in polished nickel—a boon to the motor boat owner.



Section through exhaust manifold of Harris kerosene motor showing construction of vaporizer and location of fuel changing device

New York Agent for Navy Reverse Gear

The Navy Gear Co., of New Haven, Conn., have appointed W. C. Disbrow, Jr., of 71 Cortlandt St., New York, N. Y., as distributing agent for the New York district.

Mr. Disbrow has a complete line of these reverse gears in stock and can make immediate deliveries.

The Navy gear is made in a number of sizes suitable for any type of boat or motor and for any service from the high-speed runabout to the heavy commercial craft.

Imp III, a 32-Footer

Imp III, in spite of her mischievous name, is in reality a well-behaved little cruiser, having run over 1,500 miles in 1917 with no adjustments required either to motor or equipment the entire season.

This is the type of craft a man of moderate means can well afford to own and such a staunch sensible style that it will make ready converts to the pleasures attending cruising.

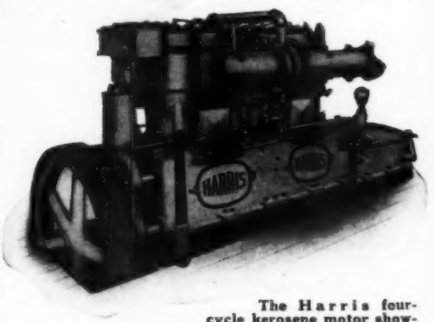
There is no gingerbread to keep polishing. Just make up the berths, clear away the breakfast dishes, and start on a cruise. Imp III has sleeping accommodations for four. She is 32 feet long, 8 feet 6 inches beam and 30 inches draft.

A Model D two-cylinder 5½-inch bore by 7-inch stroke Sterling of 12-15 h.p. turning a 20-inch diameter by 30-inch pitch Columbian propeller 550 r.p.m. producing a speed of 10½ m.p.h.

Imp III has all the speed desirable in a boat of her size and type. She was designed and built by her owners, Messrs. Smith & Graves, of Essington, Pa.

Byrne-Kingston Boston Branch Changes Address

The Boston branch of Byrne-Kingston Co., formerly located at 111 Haverhill St., has moved its complete line to 15 Jersey St., Boston, Mass., where the work will be under the direct supervision of Wm. E. Kemp, who has been a member of the Byrne-Kingston organization for over ten years and who has a very wide acquaintance among the gas engine trade and is thoroughly experienced in all branches of gas engine work and is prepared to render the best service to the trade in that vicinity.



The Harris four-cycle kerosene motor showing location of vaporizer in the exhaust manifold. These motors are built in eight sizes, developing from 30 to 220 h.p.

New Sales Director for Dayton Electrical Mfg. Co.

F. C. Eminger formerly employed as sales manager of the Splitdorf Electrical Co., of California, has resigned his position from this concern, and is now located with the Dayton Electrical Mfg. Co., of Dayton, O., in the capacity of sales director.

Mr. Eminger is the pioneer salesman of electric lighting and starting outfits for marine service, having sold the first electric lighting and starting system on the Pacific Coast for the old Apple Electric Co., of Dayton, O.

The Dayton Electrical Mfg. company will manufacture an entire new line of starters and motor boat lighting outfits.

The New Kemp Air-Drive Outfit

The Kemp Machine Wks., of Munice, Ind., have been engaged in the manufacture of the Kemp Air Drive propeller for many years, which have long since passed the experimental stage, having at one time turned out an air-cooled engine for this purpose.

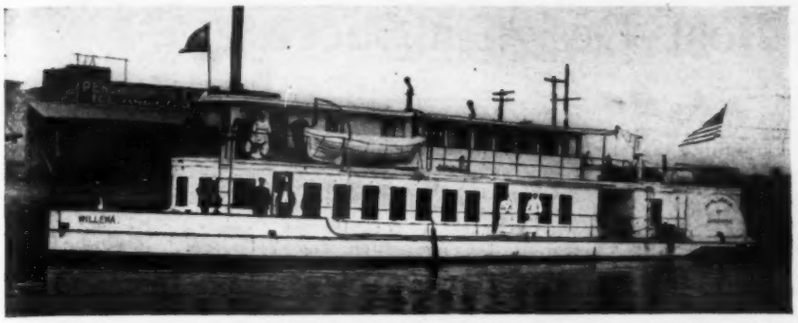
The Gray Model D 20-24 h.p. engine equipped with a Kemp Air-Drive wheel having a diameter of 7 feet and a pitch of 3 feet 6 inches, that will give a 5-ton barge 36 feet in the length and 3 feet beam, 7 miles per hour carrying five tons of merchandise.

The Gray Motor Co., of Detroit, Mich., state that with a Kemp Air-Drive wheel a boat will not draw in excess of 14 inches of water, providing, of course, the construction of the boat is not abnormally heavy.

The new Kemp wheel is so designed that the engine may be installed down in the boat, as many failures have been made on account of having the engine so high that it made the outfit topheavy. With this new Air-Drive mechanism an even balancing is secured, thereby preventing the boat from overturning in a seaway.

Mr. Hand Is Off Again

It has recently been announced that Wm. H. Hand, Jr., the well-known naval architect who has been engaged in the services of the Government as assistant to



Houseboat Willena, owned by W. H. Fahney of Chicago and used in Florida. This shallow draft stern-wheeler is 125 feet long with a beam of 23 feet. The power plant is two 50 h.p. Anderson motors, giving a speed of 8 m.p.h.

the U. S. Shipping Board since July, 1917, is now acting in an advisory capacity in the production of flying boats at the Philadelphia Naval Aircraft factory. It is interesting work, and more in his line than were the ships.

A Testimonial Letter

We have received the following letter, complimenting MoToR BoatinG, from American Vice-Consul of Johannesburg, South Africa:

"I have pleasure in acknowledging the receipt of your letter of December 7, 1917, and also your December issue of MoToR BoatinG.

"Although Johannesburg is an inland city, the special announcement of American manufacturers of boats, engines, and motor boat accessories has proved of unusual interest to callers at this consulate. These are mainly technical men who appreciate the descriptions contained in your magazine.

"I may inform you that MoToR BoatinG is read with a great deal of pleasure by engineers of the gold mines. It is customary to give the old copies to the libraries established at the mines, and in that way your magazine has become well known.

"Very respectfully yours,
"Samuel W. Honaker.
"American Vice-Consul."

Marine Specialties

H. B. Fred Kuhls, of Brooklyn, N. Y., has a complete line of paints and varnishes which are recommended for marine use. Elastic Seam Composition is a filler for deck seams, weather checks in masts, booms, spars, rails, etc., in fact, in all places where a perfectly tight joint is required. Its composition is of such a nature that it does not become hard, always remaining elastic and flexible, and the best adhering qualities.

Elastic seam paint should always be used in connection with Elastic Seam Composition, to secure perfect results. It is claimed that when used in deck seams it will last from eight to twelve years wearing down with the planking.

Elastic Seam Composition is put up in 12½-, 25-, and 50-pound kegs, in white, gray, yellow and black, and the Elastic Seam Paint comes in gallon pails from one-eighth gallon to one gallon.

Among the many other paints listed are—Elastic Gloss Yacht White for first class work, Elastic Flat Yacht White, Elastic Gloss Yacht Black, Elastic Copper Paints, Elastic Deck Varnish, Elastic anti-corrosive paint, and anti-fouling paint.

Use of Fish Oils for Operating Motor Boats

According to *Politiken* of Copenhagen, experiments have been made with motors for fishing boats to determine the practicability of using fish oils for operating motors. It is said that this has proved a success, and that it may be possible for the fishermen who now have boats equipped with kerosene motors to make some slight changes which will enable them to operate with fish oils. It is even proposed that the fishermen may make their own cod liver oil while on the sea for use in their motors.

The above statement was referred to Mr. Knudsen, manager of Burmeister & Wain, builders of Diesel motors in Copenhagen, who writes as follows:

"I take pleasure in confirming that the fish oil for Diesel motors will be excellent to use as a moving power. Further I beg to say that no doubt the said oil will also be practicable for smaller fishing boats where the motors do not work according to the principle Diesel motors, but the principle explosive motors.

This attractive 46-footer designed and built by J. Murray Watts in 1915, equipped with a six-cylinder 6x6-inch Frisbie motor, for sale

Bridgeport Motor Earns Its Cost

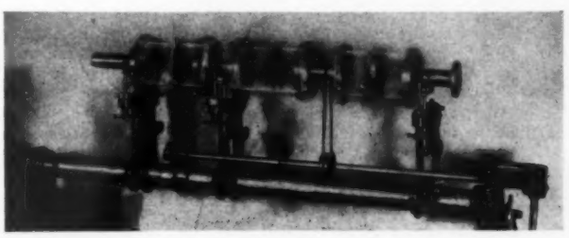
The fishing boat Jeanette, working out of Gloucester, Mass., recently made a ten-day trip that netted each man in the crew $300. They attributed their remarkable catch to the unfailing power plant of their ship, a Bridgeport motor.

These sturdy motors, both large and small, are used with equal success in commercial and pleasure boats. The smaller sizes being very popular with the fishermen for use in their dories for 'long-shore fishing and tending lobster pots.

Economical Operation on Producer Gas

The Nelson Blower & Furnace Co., of South Boston, Mass., state that the Isaac Faas, a 65-foot oyster boat sailing from Portsmouth, Va., and equipped with a Galusha gas producer, makes a trip of 40 miles at a fuel cost of eight cents and about one quart of lubricating oil when carrying a cargo of about 1,500 bushels of oysters.

The gas generated in a Galusha producer can be used in the regular four-cycle gasoline motor with only minor changes to the carbureter and intake manifold. They operate on the small, cheap sizes of anthracite coal or the non-caking grades of bituminous coal.



Crankshaft of Sterling motor in testing machine. These crankshafts must balance perfectly while rotating at high speed as well as when at rest

Trade Literature

The **Fay & Bowen Engine Co.**, of Geneva, N. Y., are issuing a very attractive catalog covering their line of boats and engines. The motors include both their two- and four-cycle models with a power ranging from 5 h.p. up to large engines developing 75 or more h.p. The catalog is copiously illustrated with ample text descriptions of each item in the line.

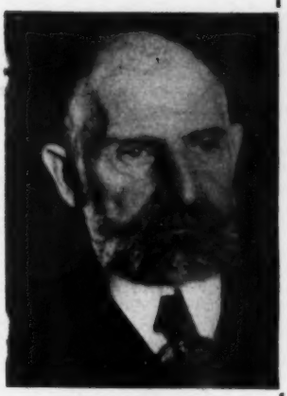
The **Lockwood-Ash Motor Co.**, of Jackson, Mich., is putting out a folder descriptive of its line of marine motors which embraces outboard motors as well as power plants adapted to the larger vessels. Full text descriptions are supplemented by really informative pictures of the various models that are being offered.

The **Kermath Mfg. Co.**, of Detroit Mich., has forwarded to us an advance copy of its new catalog covering its comprehensive line of marine motors. The Kermath motors are being offered in three models, the Standard 12 h.p., Model 16 and the Vanadium Model. An emphasized feature of these power plants is a fact that an engine bed built for the smaller model is equally available to the other two sizes in case the boat owner decides to install a more powerful engine. The catalog is fully descriptive with ample illustrations of each of the models.

Emil Grossman Mfg. Co., of Brooklyn, N. Y., is issuing a new catalog covering its line of Red Head spark plugs, several models of which are especially recommended for marine use. The new products for 1918 which are fully described in the new catalog are Fitsall One-Piece and Fitsall Splash Pan Bumpers and Ever-Good De Luxe Mirrors.

The **Sterling Engine Co.**, of Buffalo, N. Y., forwards to us an advance copy of its new catalog covering in detail its comprehensive line of marine motors. The Sterling line embraces power plants ranging from a little fellow of 10 h.p. to the huge power plants that drive the fastest racing craft. The present catalog is extremely attractive in typographical make-up with copious illustrations and aims to afford the motor boatman a guide in the selection of a marine engine.

Personalities



L. T. Snow

Levi T. Snow organized the Snow & Petrelli Mfg. Co., of New Haven, Conn., in January, 1906, and has been president and treasurer since that time.

Mr. Snow comes from old New England stock and claims to have quite a bit of salt water in his blood. His Snow forefathers settled on Cape Cod, nearly 300 years ago and the family has produced an unusual proportion of seafarers and the same is true on his mother's side. She had seven brothers, six of whom became sea captains.

Mr. Snow was born on the banks of the Penobscot River way down in Maine in 1860 and had the usual country district schooling. As a boy he worked on a farm but left home at the age of sixteen to make his fortune as clerk in a country store. At the age of twenty, he became a three years' apprentice in the machine works of the Pratt & Whitney Co., of Hartford, Conn., where he remained for three years as journeyman machinist after getting his diploma. He then came to New Haven to engage in the firearms business and in about 1890 started a small factory of his own for manufacturing Breech Loading Yacht Cannon and hardware specialties, and continued until the organization of the Snow & Petrelli Mfg. Company.

Mr. Snow has taken out several patents for his own inventions. The most important of these is the Universal Food Chopper, which has become a familiar household utensil and is used in millions of homes the world over.

He originated the name of Food Chopper as well as the Chopper and, like the London chef, it might be carved on his tomb stone when the time comes, "Peace to his hashes."

Wherever the smell of gasoline drifts over the water or the put-put is heard "The JOES" Reversing Gears and other products are universally and favorably known.

C. L. Snyder

C. L. Snyder

C. L. Snyder, president of the Wolverine Motor Wks., of Bridgeport, Conn., is one of the pioneers in the manufacture of heavy-duty internal combustion motors.

He, long, ago, saw the possibilities of the extensive use of the gas engine in commercial service and accordingly developed the Wolverine motor along suitable lines for such service.

Prior to 1899, Mr. Snyder was a large user in Tropical America of the Wolverine motor, then of the two-cycle type, which he employed not only for the propulsion of boats, but for operating plantation locomotives.

Since 1899, Mr. Snyder has been actively engaged in the manufacture of the heavy-duty four-cycle Wolverine, which has been highly developed for using cheap fuels.

Mr. Snyder keeps the latch string out at Bridgeport for all the gas engine fraternity whether manufacturers or users.

Pugsley's Guide to the U. S. Local Inspectors Examination of Masters and Mates of Sea-Going steam and Sailing Ships, with complete instructions and information for those who wish to learn navigation and save the expense of attending school by preparing themselves for examination, price, $2.00.

Pugsley's New York Pilot and Guide to the U. S. Local Inspectors examination of masters and pilots for New York Bay and Harbor with complete sailing directions from Sandy Hock to Yonkers and Great Captain Island; covers inland examinations generally, price, $2.00.

Our Air Boat Design a Success

(*Continued from page* 14)

gusts may tend to blow the machine's nose into the wind, rather than away. This is highly important (although the first machines were not built with this idea in mind, which was one of several reasons why they didn't dare fly in a wind). The importance is found in momentum. Two tons of flying machine at a hundred miles an hour have enormous momentum—just as much as huge touring cars of two tons weight making that speed on a road. Imagine turning suddenly to one side or another in such a car. The wheels would turn but the car go straight on—the wheels would break and a bad accident would result. If the airboat is suddenly turned—as it might be by a gust were it not for sufficient keel surface behind the vertical turning axis—it would be flying crabwise through the air, momentum keeping it on its old course, propeller and rudder trying to get it on a new course. This "side slip" is very dangerous. It is bad enough if it is caused by trying too sudden a turn, but if it could be caused by every gust of wind that blew, life aloft in a breeze would be life constantly in danger.

The designer must provide that the plane have as much tendency as possible to stay on an even keel. The pilot has control of his balance, but he cannot be forever balancing—he has many other things to do. So the designer helps him by giving the wings what he calls a dihedral angle—that is, a front view of the airboat shows the wings as a very flat V. The result is that when the whole structure tips in the air, the horizontal equivalent of the lower wing is greater and that of the elevated wing less, than before. As the horizontal position provides the greatest lift, tipping the dihedral angled wings produces the greatest lift on the down side, which tends to right the tipping machine. But too much dihedral angle decreases the total horizontal equivalent of the surfaces, increasing the proportion of weight to surface, and also tends to throw the center of gravity too low, which results in a pendulum like motion to the plane.

One other thing the designer can do to help lateral stability, and about which few besides pilots and designers know even the name. The designer and the rigger wash out one side of the aeroplane and wash in the other side. To wash out a plane is to decrease its angle of incidence toward the end of the plane. It is done on one side, and the angle increased or washed in on the other side, to counteract the desire of the plane to revolve over and over in a direction contrary to that of its propeller. In other words, the engine tries to turn the propeller in one direction and incidentally, itself in the other direction. If it were not for the wash out and wash in the pilot would be continually combating this desire of the plane to roll in the air.

Longitudinal stability, too, is a problem of the designers. A properly built plane is nose heavy, that is, if the power fails aloft, the plane automatically drops nose first, just enough to reach the best gliding angle, by which gravity takes the place of the propeller thrust and maintains that speed by which, and by which alone, control of the whole is maintained in the air. But it is not only a proper placing of the center of gravity which the designer must consider—not too low, that there be no pendulum effect and not too high, that the whole thing not turn turtle at the first opportunity,—he must remember that gusts of wind do not blow only from side to side, but from below up and from above down.

The tail surface is relied on here, and it is a beautifully simple contrivance. It is set at a less angle of incidence than the main planes. If a gust of wind tilts the plane nose down from the horizontal, the craft does not immediately go in the direction its nose is pointing, but somewhere between the old course and the new, because of the inertia and momentum, just as when a gust turns the plane sidewise it side slips.

The result is that the effective angle of incidence of the planes which is their angle to direction of motion, is less than normal. This means decreased lift. But the tail surface, having a less angle than the main planes to start with, loses more of its angle than the main planes with this crab-wise nosing downwards. So the tail now having less lift tends to fall more quickly than the nose, and the plane rights again, although, of course, at a lower altitude.

Nothing has as yet been said about those small parts of a plane which enable it to fly at all—the ailerons or flaps or warping surfaces, whichever scheme is used. Probably the general public is more familiar with them than with any part of the plane. All planes must possess some one of the three, for the very life of the plane depends upon the ability of the pilot to bank the machine—this is, depress or raise one side at pleasure. Were it not for this ability, he could not turn a corner, he could not make a spiral, he could not balance himself against gust stronger than the dihedral angle would take care of—he could not fly.

Ailerons are little extra surfaces, movable, between the two main planes, at either end. Flaps are hinged parts of the main plane or planes, at the rear and towards the ends, which can be depressed, increasing the angle of incidence at that point. In the warping wing, the original Wright patent, the ends of the wings are pulled out of shape, to change the angle. The point is that when one aileron, flap or warping wing tip increases the angle of incidence on one side, the corresponding part on the other side of the plane does the reverse. The angle being increased on side, lift increases on that side—decreased on the other, lift decreases. Result, the whole plane tips.

Nor has anything been said about the engine problems—the need for a power plant which will keep cool, which will run evenly and regularly at high speed and stay lubricated, and which is reliable, reliable, reliable. Nothing has been said of the problems of the propeller designer, who must calculate the thrust his propeller must have, with a given number of revolutions per minute, which must be strong and reliable, which must produce the maximum thrust with the minimum slip (all motor boatmen will recognize that term!).

But enough has been said to indicate that building a flying boat is something more than putting wings on a hull, and that the art of the designer—as quite apart from that of the rigger to whom is intrusted the delicate task of assembling the whole with just the right angle to all surfaces, just the right tension and strain on all wires, or the manufacturer who must provide the maximum of strength with the minimum of weight—that the art of the designer of the modern flying device, be it air boat, speed plane, bomb dropper, passenger carrier or huge tri-powered triplane for transportation of freight or passengers is one large compromise, between the things one would like to have, the things one can have and the things one just must have to fly at all!

Formerly year by year now, due to the rapidly accumulated experience of war practice, almost day by day, the compromise becomes more and more efficient. Never, so long as the laws of physics as we know them continue in effect will head resistance not increase with the square of the speed—and stream line hulls and spars, even to stream line wires, are cutting it down, down, down. We can never hope to have the theoretically ideal propeller, which is one the power of which is all thrust and no slip, for the very simple reason that without slip there is no thrust, whether the medium be water or air! But our propellers grow more and more efficient as we learn more and more of the needs. Never can we hope to ride in the air as the motor boatman rides on a still lake, with no need for balance or care for the stabilities, but automatic stabilizers have come, and modern planes will steer and balance themselves in reasonably calm air. Never can we have the maximum of climb and the maximum of speed at once, with our present ideas of physics and the laws of flight, but our best climbers to-day are faster than the fastest speed machines of a few years ago, and our speediest planes climb as well as the first tentative little air bugs we proudly called flying machines ten years in the past.

And there is this to be said—and it is really worth saying. Many and many a man has given his life in high endeavor, because we didn't know about this or that law or aerial condition. Other men will give their lives in engine or plane failure, in the future. But never again need a man die because we do not know the laws which govern flight—no man need give up his most precious possession that we may learn that nature forbids this or that.

America's Opportunity

(*Continued from page* 60)

hopelessly behind every European country in aeronautics.

From St. Johns, Newfoundland, to Queenstown, Ireland, is 1,860 miles. From St. Johns to the Azores is 1,300 miles and from the Azores to Oporto, Portugal is 850 miles. Waiting for a strong following wind, one should average 100 miles an hour across. The crossing from St. Johns to Queenstown could be accomplished under twenty hours; from St. Johns to the Azores under fourteen hours, and from the Azores to Oporto under nine hours.

An aeroplane can remain up as long as the engines run, whether one hour or 1,000 hours. The engines, barring breakdowns, will run as long as fuel is supplied. The question then is one of lifting ability. Can the aeroplane lift a great enough weight to make it possible? It can. An aeroplane which would lift thirty-five hours' fuel, and four men can easily be constructed. That would be an aeroplane with fifteen hours' fuel more than would probably be necessary.

The great danger in the transatlantic flight is engine failure. It is planned to build a huge triplane with four motors, which will fly when only two are being used. Thus if one engine gave out or even two gave out, the machine could be flown with the remainder, while the others are being repaired.

But with a good engine no trouble should be experienced. Lots and lots of aeroplane engines are run for periods greatly exceeding twenty hours without difficulty and without repairs of any sort. A German before the war flew for over twenty-five hours without stopping his engine. This was before the war and only an aeronaut realizes what that means. The Germans have been bombarding London, both by night and by day for the last eight months, making long flights from their bases in Belgium.

Last July a Handley-Page flew from London to Salonika and then proceeded to bomb Constantinople. It was thirty-one hours in flight, covering a distance of over 2,000 miles. It made two or three stops on the way, but experienced no trouble and nothing was done to the engines, and thus it may be called one continuous flight.

Export and Import Trade Notes

Rulings and Decisions of the War Trade Board That Are of Interest to Manufacturers and Agents Engaged in Export and Import Trade

Revocation of Temporary Import Licenses

The President's Import Proclamation dated February 14, 1918, requires an import license for all articles from all countries. This became effective February 19, 1918.

To avoid congestion of traffic at docks, and on railroads crossing the border, it was found necessary to issue three temporary general licenses. The first covers all commodities from Canada except those covered by the President's Import Proclamation of November 28, 1917; the second covers all goods in transit from all countries on February 16, 1918, except goods covered by the President's Import Proclamation of November 28, 1917; the third covers all fresh fruits and vegetables from all countries.

By the issuance of these general licenses, opportunity is given the importer to apply for and obtain regular import licenses for future shipments so that when these arrive at ports of entry, such licenses may be presented to the collectors and the goods entered. These are temporary measures and will only be permitted to remain in effect until the necessity for their adoption disappears. The Bureau of Imports is equipped to handle applications for licenses without delay, practically all applications being passed upon within twenty-four hours from the time of their receipt.

It is, of course, of the highest importance that the import control be put into complete effect at the earliest possible moment so that the many beneficial results thereof may be felt immediately. The War Trade Board, therefore, has determined that the second and third of these general licenses mentioned above be revoked at 12 o'clock P. M. on March 4, 1918. The date of the expiration of the first general license covering goods from Canada not mentioned in the President's first Import Proclamation, has not been determined. It will be necessary, therefore, for importers to have their import licenses ready to present for all goods which arrive after 12 o'clock P. M. on March 4, 1918, except goods from Canada, as above stated.

No telegraphic applications for license will be received, but in urgent cases licenses will be sent out by telegram after proper written applications have been received and passed upon.

Export License Procedure

On February 16, 1918, the War Trade Board published a statement referring to the President's proclamation of February 14, 1918, in which it was stated that collectors of customs would accept shippers' export declarations in lieu of individual licenses for all goods which had not hitherto required licenses, when it could be shown, to the satisfaction of the collectors, that the goods were covered by either a bill of lading marked "for export" or a through export bill of lading, provided the bill of lading was dated February 19, 1918, or earlier, and, further provided, the goods were actually exported by March 15, 1918.

The War Trade Board assumed that all exporters who were interested in shipments covered by bills of lading as above described, dated February 19, 1918, or earlier, would immediately apply for export licenses and would receive the same in ample time to be used by them on or before March 15, 1918. It has now been called to the attention of the War Trade Board that there is at present a considerable congestion of freight at various ports which will make it impossible for all goods covered by the above ruling to be exported on or before March 15, 1918. In order, therefore, to take care of the situation, the Board has adopted a simple form of procedure to be used in those cases where the goods

(1) are covered by either a bill of lading marked "for export" or a through bill of lading dated February 19, 1918, or earlier, and

(2) did not need a license prior to the President's proclamation of February 14, 1918.

Any exporter or shipper who may be interested in shipments of this character which are not exported by March 15, 1918, should present his export declarations in quadruplicate, using form Customs Catalog No. 7525, to the nearest branch office of the War Trade Board, and this branch office will license such shipments on the export declaration, without requiring the shipper or exporter to file a formal application. These export declarations, when licensed, will be of use only if the goods are actually exported by April 15, 1918. It is believed that most of the shipments which would come within the original ruling will be exported by April 15, 1918, but, if any shipper or exporter has reason to believe that his shipment will not be exported by this date, he has several weeks within which to file a formal application and to receive a license which will be valid for the usual period.

As export licenses are normally valid for ninety days, any shipper who has reasonable cause to believe that his shipment may not be exported by April 15, 1918, should not wait until then to file his formal application, but should do so immediately, and then, if the formal license becomes necessary later on, he is fully protected.

Exporters should note that no shipment consigned to any country mentioned in the first half of the proclamation of August 27, 1917, is covered by this new ruling, as all shipments to these countries have required a license for some time past.

Powers of Attorney Required After March 1, 1918

The Bureau of Exports of the War Trade Board calls the attention of shippers to the fact that on and after March 1, 1918, the following rules will be in effect, governing applications for export licenses:

Applications for license to export, if applied for by a corporation, must be signed by an officer of the corporation or a duly authorized agent of the corporation; if made by a partnership, must be signed by a member of the firm or its duly authorized agent; if made by an individual, must be signed by the individual or his duly authorized agent. The authorization given by a corporation, partnership or individual to its agent must be by means of a power of attorney. Heretofore the Bureau of Exports has accepted applications signed by shipping clerks and other employees of corporations, but, in view of the fact that this has led to certain abuses on the part of persons who have applied for licenses, this power of attorney will, on and after March 1, 1918, be required before these applications will be considered. It is suggested, therefore, that all exporters who are in the habit of having licenses applied for by a shipping clerk, forwarding agent, or anyone else, file immediately with the Bureau of Exports a power of attorney. These powers of attorney must be acknowledged before a notary public and must bear the necessary twenty-five-cent revenue stamp. The information contained in these powers will be sent by the Bureau of Exports to all the branch offices. The form of power of attorney to be used was published in the Journal of the War Trade Board No. 2 of December 10, 1917.

It should be specifically noted that such power of attorney will be required not only to enable an employee of the shipper to execute an application for export license; but it will also be necessary to enable any person, firm or corporation, not the owner of the goods sought to be exported, but acting as forwarding agent or broker, to apply for an export license on behalf of any other person, firm or corporation.

Foreign Branches of American Firms Must Obtain License to Perform Contracts With "Enemies"

The War Trade Board has determined that, in general, branches of United States corporations and other American houses established in neutral territory or in the territory of countries associated with the United States in the war, shall obtain an enemy trade license from the War Trade Board before performing contracts, the performance of which involves trading with an enemy or ally of enemy.

As announced on January 4, 1918 (War Trade Board Journal No. 5 p. 6), the War Trade authorized branches of American houses in foreign countries to perform all legal obligations enforcible in the courts of the country in which such branches were established, notwithstanding that such performance should involve trading with an enemy or ally of enemy. This authorization has been rescinded and, in general, such branches must hereafter obtain a special enemy trade license covering the particular transaction before performing any contract which involves trading with an enemy or ally of enemy.

The foregoing rule is subject to two exceptions, as announced on January 28, 1918, and published on page 9 of War Trade Board Journal No. 6. Under the authorization of the Board, announced on that date, foreign branches of American houses are licensed to deal in enemy commercial paper when refusal to do so may result in failure to collect the debt, or will be a violation of local law, and branches of American banks are authorized to receive enemy paper for collection and to participate in clearing house transactions in the ordinary course of business, notwithstanding enemy membership in the clearing house involved. The foreign branches are also authorized to pay or receive rent under existing leases to or from enemies or allies of enemies, as the case may be.

The announcement of January 4, 1918, which has been rescinded, follows in full:

"The War Trade Board has authorized branches of American corporations and other American houses established and engaged in business in neutral countries and in countries associated with the United States in the war to accept and pay drafts, to deliver goods, warehoused or otherwise stored, and to perform other similar acts, notwithstanding such acts may involve trading with enemies or allies of enemies, when such acts are necessary to prevent a breach or violation of a law or commercial obligation enforcible in the courts of the country in which such branch is established: (1) That nothing herein contained shall be held or construed to authorize said corporations, houses, or their branches to hereafter undertake or enter into contracts or business or commercial transactions which will involve trading with enemies or allies of enemies in order to carry out or perform the same; and (2) That every case involving transactions of trading with the enemy or enemy allies be reported to the War Trade Board within thirty days after the occurrence thereof, upon a form to be furnished by the War Trade Board."

Registering New Vessels as American

Action has been taken by the War Trade Board, in co-operation with the United States Shipping Board, to insure that all the vessels turned out under the ship building program, or otherwise, shall be registered as American vessels and thereby kept under the control of the United States Government.

In order to effect this a ruling has been adopted by the War Trade Board, which will be incorporated as Paragraph VI in General Rules No. 1, Governing the Granting of Licenses for Bunker Fuel, Port, Sea and Ship's Stores and Supplies, and which reads as follows:

"No applications for bunkers by any vessel built in the United States and completed after February 1, 1918, shall be granted, unless the vessel is documented under the American flag, or unless the United States Shipping Board shall have waived such documentation."

Clause (0) of Paragraph V of the General Rules No. 1 above referred to, as amended February 5, provides that no neutral or uncommandeered American vessel shall be bought or sold without the previous approval of the United States Shipping Board, the War Trade Board, or the Inter-Allied Chartering Executive.

In the application of this clause (0), the War Trade Board has issued the following announcement of the principles which will guide their action in the administration of this paragraph, which is to the following effect:

"That applications for permission to buy or sell the vessels mentioned in clause (0) of paragraph V should be made in the first instance to the United States Shipping Board, and that the War Trade Board would be governed by the decision of the United States Shipping Board upon such application."

For the further guidance of applicants for permission to buy or sell vessels under Section (0), the following rules of the Shipping Board have been issued:

"Applications to the Shipping Board for permission to buy or sell vessels under Section (0) of Paragraph V of the War Trade Board's General Rules No. 1 should include the following information:

1—Name of Vessel.
2—Official Number.
3—Date of Construction.
4—Type of Vessel.
5—Gross Tonnage.
6—Deadweight Capacity.
7—Speed.
8—Name of Purchaser.
9—Citizenship*.
10—Number of Years Experience on the Part of the Purchaser in Operating Vessels.
11—Trade in Which Purchaser Proposes to Place the Vessel.
12—Total Price.
13—Price per Deadweight Ton.

"* Attention is called to the following definition of a citizen of the United States, as given in Section 2 of the Shipping Act approved September 7, 1916:

"That within the meaning of this Act, no corporation, partnership or association shall be deemed a citizen of the United States unless the controlling interest therein is owned by citizens of the United States, and, in the case of a corporation, unless its president and managing directors are citizens of the United States and the corporation itself is organized under the laws of the United States or of a State, Territory, District or possession thereof."

Exports of Manufactured Rubber Goods

On February 6, 1918, the War Trade Board placed all commodities containing rubber on the conservation list. In accordance with its usual practice in cases of a similar character, and to provide a ready method for licensing shipments in transit, the Board has ruled that certain shipments of commodities containing rubber may be informally licensed by the branch offices of the War Trade Board when such shipments are destined to those countries mentioned in the second half of the proclamation of August 27, 1917. To all other destinations these goods have needed a license for some months. The shipments which may be licensed in accordance with this ruling are those which are covered by:

(1) Ocean bill of lading dated February 13, 1918, or earlier; or

(2) Dock receipt dated February 13, 1918, or earlier; or

(3) Through export bill of lading dated February 13, 1918, or earlier; or

(4) Bill of lading marked "for export" dated February 13, 1918, or earlier.

To obtain a license, shippers of goods covered by the above shall present their export declarations in quadruplicate at the nearest branch office of the War Trade Board, using shippers' export declaration Customs Catalog No. 7525, as described in Journal No. 4 of the War Trade Board. No formal application need be made on shipments of this character. The branch office will license the shipment on the declaration but the declaration when licensed will be of use only if the goods are actually exported by March 15, 1918. All shipments not specifically covered by the foregoing will require a regular export license, which must be formally applied for on the customary application form.

It should be noted that this ruling does not apply to shipments of crude or scrap rubber which have required formal export licenses since November 28, 1917.

Consignor-Consignee Agreement

The War Trade Board announces that regulations requiring shippers, who propose exporting goods to their branches or agencies abroad, to execute and file with the Board a certain form of agreement, are suspended in the case of shipments consigned by individuals, firms, or corporations in the United States to their branches or agencies located in the United Kingdom, France, the Dominion of Canada, Australia, New Zealand, or the Union of South Africa. Before, or at the time of filing applications for export licenses for shipments to their branches or agencies located in any other country, exporters should execute and file with the Board, the prescribed form of agreement.

Procedure for Licensing Shipments to Holland

The War Trade Board announces that the following procedure has been adopted for licensing shipments to Holland.

Prospective importers in Holland should obtain from the Netherlands Overseas Trust Company an import certificate. Upon receipt of the certificate, the importer should notify the prospective exporter that such a certificate has been obtained and advise him of the serial number thereof. The exporter should thereupon apply to the Bureau of Exports, No. 1435 K St., N.W., Washington, for an export license, using application Form X and such Supplemental Information Sheets concerning the commodity as are required, and, in addition, furnish on Supplemental Sheet X-102, the gross weight of the proposed shipment, the serial number of the import certificate of the Netherlands Overseas Trust Company.

Upon receipt by the Bureau of Exports of such application for export license, properly executed, and after due consideration by the War Trade Board, the particulars thereof, if it is deemed advisable, may be forwarded to the War Trade Board's representative abroad. This information will be sent by mail unless the applicant requests on Supplemental Sheet X-102 that it be cabled at his expense. Upon receipt of reply, the application will be given further consideration, and when a decision is reached, the applicant will be promptly advised.

Applicants should not forward funds with their applications.

With the Commercial Fleet

Trade Notes and Announcements of Interest to the Commercial Boat Owner

Powered with two Buffalo 50-80 h.p. motors, Tarahne makes regular trips on Atlin Lake, British Columbia. She carries both freight and passengers, and belongs to the White Pass and Youkon Route

A Power Plant for Canal Boats

The opening of the New York State Barge Canal on May 15, 1918, will render obsolete many unpowered canal boats of the old mule-drawn type, since the laws provide for power craft only, and the tow paths have been eliminated. The new barge canal, in the utilization of canalized rivers and lakes, permits a speed in some portions above that of the lumbering mule-powered craft, hence the practicability of substitution of the mechanical horsepower barge. With the application of power, six miles per hour are possible in the cut portions, and where lakes and rivers are utilized, the speed is limited only to that of the boat.

The Sterling Engine company's device for the utilization of these barges consists of a steel tunnel, which is inexpensive in construction, and which is fastened in the hull, the propeller operating in the tunnel. Inasmuch as the construction of a tunnel of any other type, for these boats, would require the tearing down of a portion of the deck and rear cabin of the canal boats, the Sterling device has been drawn up with the idea of attachment with as little inconvenience as possible.

The boats are docked and the steel tunnel is fitted into place and bolted in, an arrangement being made for packing so as to make the attachment water-tight.

In the top of the tunnel there is a large manhole to permit the cleaning of weeds or any obstructions from the propeller wheel.

Provision is made for driving the propeller through the usual stern bearing, the power being furnished by either one or two of the Model D, two-cylinder, 12-15 h.p. Sterlings, which have ample power for this class of work.

Two of the tunnels have actually been constructed by the Sterling Engine Co., of Buffalo, N. Y., and are ready for application to the boats.

The device was patented in 1914 by C. A. Criqui, president of the Sterling Engine company, who originated the idea. It shows the extent to which the Sterling company is applying its resources to the needs of the power boatmen. The device is feasible and practical, and it should be given due consideration in view of the urgent need of all available barges to relieve the freight congestion.

There are many barges of a capacity of 250 tons, which could well utilize this tunnel system. Two of the D, 12-15 h.p. Sterling motors in connection therewith would easily furnish sufficient power for towing purposes, and the beauty of it is that an engineer need have but a limited amount of experience in the operation of the motors, as they are extremely simple and sturdy, yet noted for their reliability as a work boat motor.

The illustration, which was taken from the letters patent, amply describes the system.

To Standardize Motor Life Boat

The Marine Standards Committee of the Society of Automotive Engineers has been at work for some time upon the standardization of certain parts of the power transmission used in motor boats. From the propeller through the reverse gear and up to the motor, all parts have received careful attention and study, and these standard dimensions will shortly be available for the use of all manufacturers in the marine field. In addition to this, certain new subjects for standardization were discussed at a recent meeting of the Marine Standards Committee at which members of the National Association of Engine & Boat Manufacturers formed an important part.

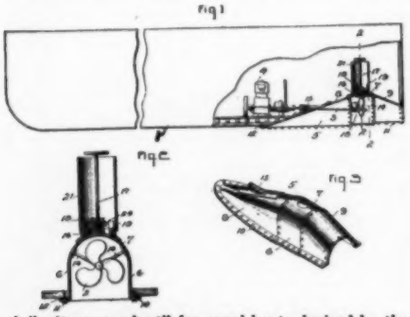
Mr. Henry R. Sutphen, president of the National Association, is also chairman of the Marine Standards Committee of the S. A. E., and among other matters that he brought to the attention of those present was the possibility of standardizing a motor life boat to be part of the equipment of all sea-going vessels.

With a motor-driven life boat on these ships the number of lives lost at sea could be very materially decreased. It is a well known fact that even after a ship has been sunk and the passengers and crew have succeeded in taking to the life boats and life rafts, many lives have been lost through exposure to the elements and other causes before help could be brought to the survivors, or before the boats could reach the nearest shore. In the event that a motor life boat was available, the remaining boats could either be towed to land or, if distance made this impracticable, they could be made fast to the motor life boat and kept headed up into the wind and "mothered" until rescuing vessels arrived.

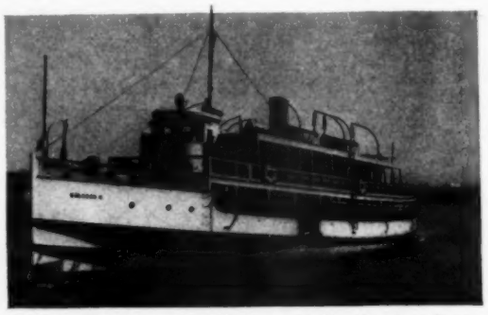
To work in conjunction with the Marine Standards Committee in developing a standardized motor life boat, the following committee was appointed from the National Association of Engine & Boat Manufacturers:

Chairman, Henry R. Sutphen, of the Elco Wks., Bayonne, N. J.; George F. Lawley, of Geo. Lawley & Son Corp., Neponset, Mass.; Capt. A. P. Lundin, of the Welin Marine Equipment Co., Long Island City, N. Y.; James Craig, of James Craig Engine & Machine Wks., Jersey City, N. J.; Charles A. Criqui, of Sterling Engine Co., Buffalo, N. Y.

In order that the requirements of the United States Government may be fully developed in the construction and equipment of the standardized motor life boat, it is hoped that the Department of Commerce will consent to the appointment of one of its representatives to this committee.



A "unit power plant" for canal boats devised by the Sterling Engine Company



Motor-powered ferry boat Nelseco, of New London, Conn.

A Motor-Powered Ferryboat

This up-to-date power ferry is in daily service carrying New London Ship & Engine company workers between New London and the company's plant in Groton, Conn. The hull was built by Irwin Reed, of Boothbay Harbor, Me., and towed to New London for the installation of the motor, which is an eight-cylinder Nelseco-Diesel developing 240 h.p.

The overall length is 123 feet with a beam and draft of 30 feet and 7½ feet, respectively. Her passenger capacity is 600, accommodations for both men and women workers being a feature. With a Hyde wheel having 60-inch diameter and 40-inch pitch, she makes a speed of 11½ knots.

Nelseco is a fine example of a motor-powered commercial boat and is giving entire satisfaction to the owners.

California Boat Builders Busy

Maddern Bros., of Sausalito, are building a 64-foot fishing boat for the Western California Fish Company, which will be used in the waters between Monterey and San Francisco. She is powered with a 50 h.p. Standard engine.

George Kneass, of San Francisco, is building two motor boats for patrol work of the Peruvian navy, to be known as El Capitan I and El Capitan II. Each will be powered with a 16 h.p. Union gas engine.

William Cryer, of Oakland, is building a fishing tug for the Western California Fish Company. She is to be 60 x 15 x 7 feet and powered with an 80 h.p. Standard engine.

Frank Stone, Oakland, is building a small freighter for the Golden West Brewing Co., of Oakland which will be powered with twin 35 h.p. Union engines. The boat will be used in the river trade in this State.

San Francisco Bay Boat Builders Busy

Another forward step in river transportation in California was taken during March, when John Fletcher, of Stockton, decided to enter the business and gave orders to William Cryer & Son, boat builders of Oakland, to build half a dozen motor boats for freight purposes as rapidly as possible. These boats will be 52 feet over all by 15 feet beam and 5 feet draft. They will be powered by four-cylinder 85 h.p. Acme gas engines, built in San Francisco. This makes the third contestant for the business of the Sacramento and San Joaquin Rivers. Between the Island Transportation company and the Colberg Boat company a vigorous rivalry has brought about the building of a number of motor boats both for freight and passenger service. Fletcher says that he is not going to enter into any cut rate warfare with the others, as there is enough business for all. The Colberg company are also using Acme engines, six cylinders of 65 h.p. and the Transportation company are equipping with Wisconsin motors of 92 h.p.

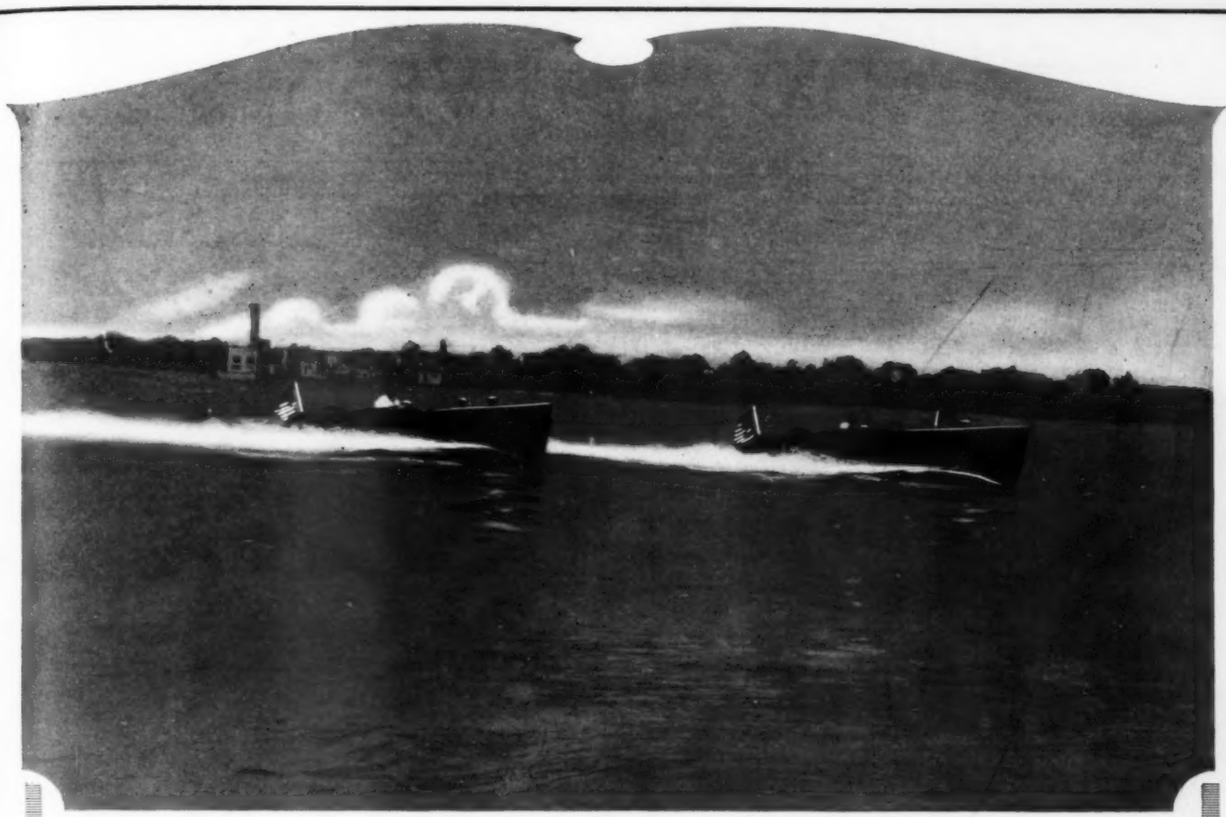
A new launch for the Henry Peterson, Inc., launch and towboat people, has just come off the ways at the George Kneass Shipbuilding Yards in San Francisco. The new boat, which is 42 feet in length by 13 feet beam, has the pilot house control and can be operated by one man. She will be powered with a 50 h.p. Union gas engine. Aft of the cockpit thirty or forty passengers can be accommodated with shelter, and several bunks are located forward for emergencies. Another launch building for the same company will be 64 feet in length and 18 feet beam. Her power will be a 110 h.p. Union gas engine.

Alaska Packers Increase Fleet

The Alaska Packers' Association, of San Francisco, is constantly increasing the number of its power boats. At present the Packers are having two boats built by William Cryer & Son at Oakland. The first is a launch, as yet unnamed, to be 72 feet in length by 16 feet beam. She will be powered by a Standard gas engine of 110 h.p., three cylinders, and it is intended to utilize her for towing fishing barges. The launch Auprey for the same association is about complete. She is 75 feet in length and 20 feet beam. Two 85 h.p. Standard gas engines furnish the power.

The power schooner Alasco II, built for the Alaska Codfish company by Maddern Bros., Sausalito, will leave for the company's northern fishing stations in a few days under her own power. She is 47 feet long and is equipped with a 40 h.p. Union gas engine.

Totom, a 48½ by 13½-foot fishing boat powered with a 36 h.p. Gray-Prior four-cylinder, four-cycle motor



"Belle Isle" boats are Valsparred

This picture shows two of the latest standard 26-foot mahogany-finished boats built by the Belle Isle Boat and Engine Company of Detroit.

One was purchased for government service, the other is owned by Mr. Fred E. Holmes of that city.

VALENTINE'S VALSPAR
The Varnish That Won't Turn White

In line with other high-class boat-builders, the Belle Isle Company uses Valspar exclusively for all their woodwork. These boats are painted below the water-line with Valspar Bronze Bottom Paint. Thus they are proof against paint and varnish troubles.

Valspar is a long-oil quick-drying varnish of exceptional water-proof qualities. It dries dust-free in two hours and hard overnight. It resists the attacks of sea-air, storms, fog, and the hottest sun without blistering, cracking, or peeling off, nor will it turn white under the most trying conditions. It is the perfect varnish for all kinds of boats.

Our little booklet, "How to use Valspar on Boats," is full of useful hints for owners of boats. We shall be glad to send you a copy free on request.

For your paintwork use Valentine's Yacht White, Valentine's Yacht Black, Valspar Bronze Bottom Paint and Valspar Enamels.

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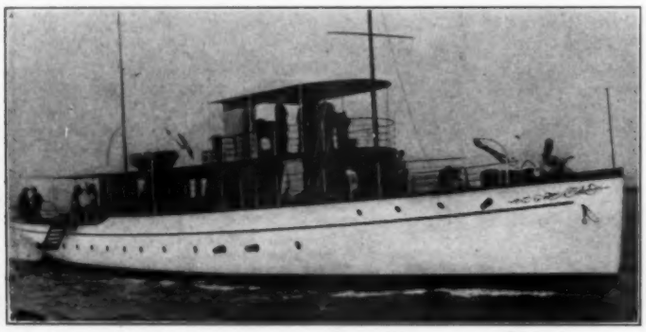
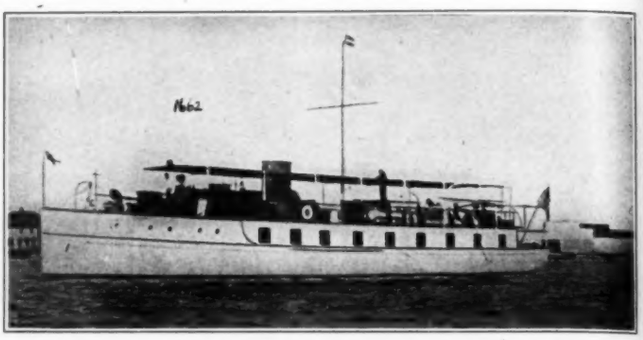
We have a complete list of all steam and power yachts, auxiliaries and houseboats available FOR SALE and CHARTER. A few are shown on this page. Plans, photographs and full particulars furnished on request.

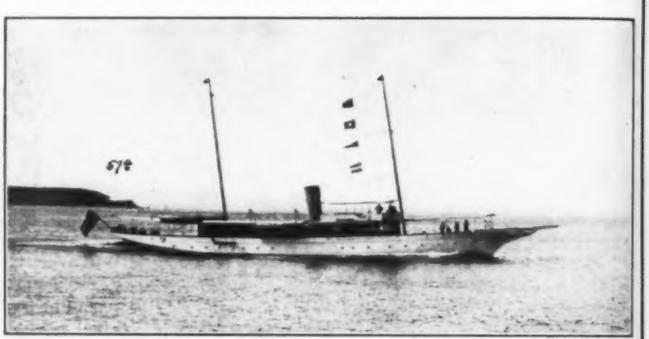


No. 2029—For Sale—110 ft. steel twin screw cruising power yacht; speed up to 15 miles. Large accommodation; dining saloon and social hall on deck; six staterooms, two bathrooms, etc., aft. Large cruising radius. Cox & Stevens, 15 William Street, New York.

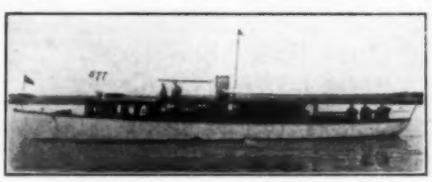


No. 1662—For Sale or Charter—Attractive 90 ft. twin screw gasoline houseboat; speed 10-12 miles. Large saloon, four staterooms, two bathrooms; all conveniences. Handsomely furnished. Cox & Stevens, 15 William Street, New York.

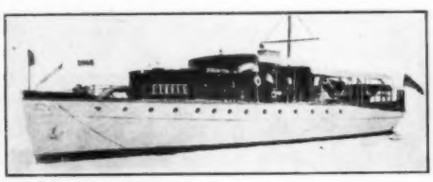
No. 3374—For Sale—New, three masted auxiliary schooner yacht (built for service on Alaskan Coast); 132 ft. on deck, 25 ft. beam, 14 ft. draft. Extra heavy wood construction. Large stateroom accommodation. Speed under power about 7½ miles. Ice machine, hot water heating plant, etc. For further particulars apply to Cox & Stevens, 15 William Street, New York.



No. 57—For Sale—Fast, steel, steam yacht; 145 x 17.3 x 7 ft. Speed 16 to 18 miles. Deck dining saloon, three staterooms, two bathrooms, etc. Handsomely finished and furnished. Fine condition. Estate anxious to sell. Cox & Stevens, 15 William Street, New York.

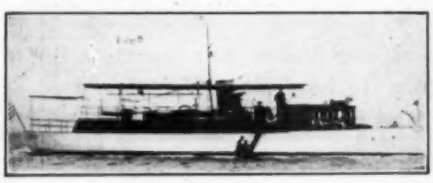


No. 577—For Sale—Twin screw cruising power yacht; 88x 14 x 4.6 ft. Speed 14-16 miles. Best construction and finish. Large dining saloon and galley forward; two double staterooms aft. Price very attractive. Cox & Stevens, 15 William Street, New York.



No. 2888—For Sale—Twin screw Diesel power yacht; 110 x 18 x 6 ft. Speed 12-14 miles; two 150 H.P. 6 cylinder Craig-Diesel motor. Dining and main saloons; four staterooms, bath, four toilets, etc. Very economical to operate. Cox & Stevens, 15 William Street, New York.

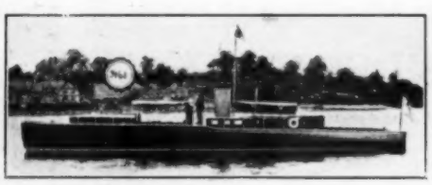
No. 1070—For Sale—Modern gasoline cruiser; 60 x 11.6 x 3.9 ft. Speed 11 miles. Dining saloon forward; main saloon (convertible into stateroom) and double stateroom aft. Very able, desirable craft. Best construction. Low price. Cox & Stevens, 15 William Street, New York.



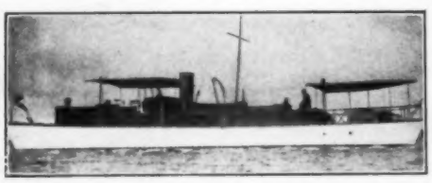
No. 1130—For Sale—Roomy and able gasoline cruiser, 70 x 13.6 x 3.6 ft. Speed 11-13 miles; 6 cyl. Winton motor. Dining saloon, three staterooms, bath, main saloon, etc. Low figure accepted.

No. 3529—For Sale—Fast, up-to-date 60 ft. bridge deck cruiser. Speed 18 miles; 8 cylinder Van Blerck motor (new 1917). Double stateroom, saloon, large galley, etc. Cox & Stevens, 15 William Street, New York.

No. 657—For Sale or Charter—Attractive bridge deck cruiser; 54 x 11 x 3 feet. Speed 11 miles; 30 H.P. Twentieth Century motor. Double stateroom, saloon, toilet and bath. Electric lighted. Finished in teakwood throughout. Cox & Stevens, 15 William Street, New York.



No. 3461—For Sale or Charter—Twin screw express day cruiser; 65x9x3.3 ft. Speed up to 25 miles; two 6 cyl. Van-Blerck Motors (new 1917). Accommodations for four in owner's party. Best construction. Cox & Stevens, 15 William Street, New York.



No. 2826—For Sale or Charter—Cruising power yacht; 85x 14x4.6 ft. Speed 11-13 miles. Dining saloon, two double staterooms, bath, two toilets; independent lighting plant, etc. Large deck space. Exceptional opportunity. Cox & Stevens, 15 William Street, New York.

No. 3547—Special Opportunity—Smart, high speed V-bottom day cruiser; 50 x 10.6 x 3 ft. Built 1917. Speed up to 22 miles; 200 H.P. 8 cylinder Sterling motor (counter-balanced crank shaft—Model F). Steerman's bridge forward, roomy cabin with sleeping accommodation for four, toilet, galley, etc. Large after cockpit. Price low for immediate sale. Cox & Stevens, 15 William Street, New York.

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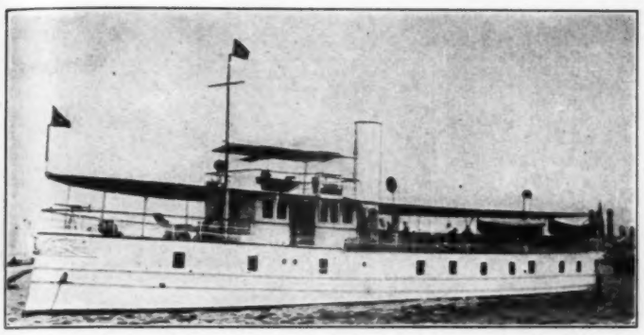
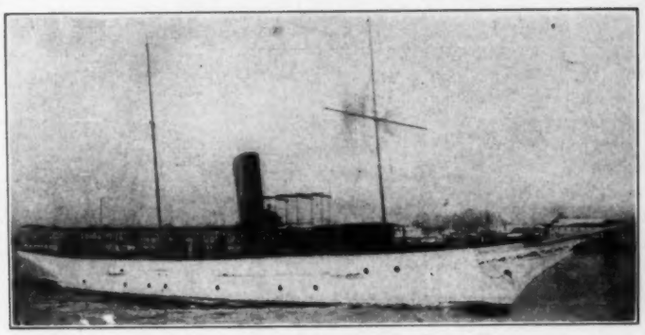
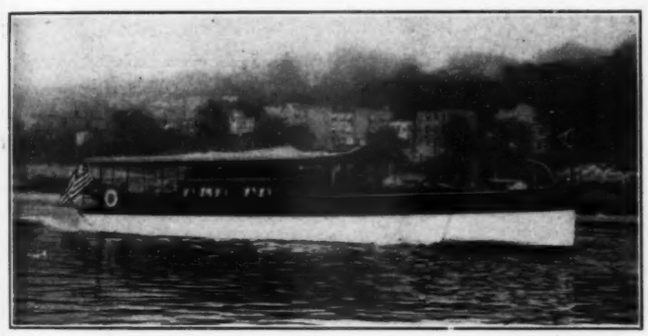


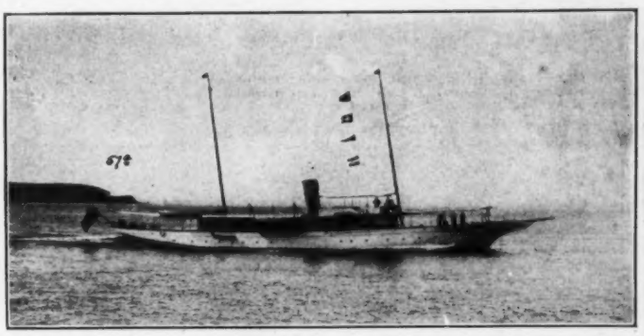
No. 243—Sale—Charter—Twin screw steam houseboat, 116 ft. x 21 ft. x 4 ft. draft. 4 staterooms, 3 bathrooms, dining saloon and smoking room.



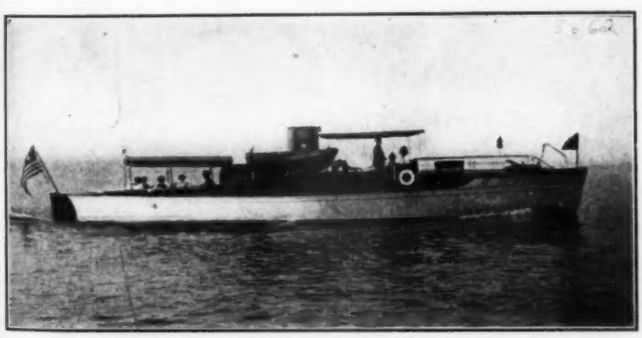
No. 7987—Sale—Charter—106 ft. cruising motor yacht; speed 13 knots; 4 staterooms, bathroom, main saloon, deck dining saloon, etc. Full equipment.



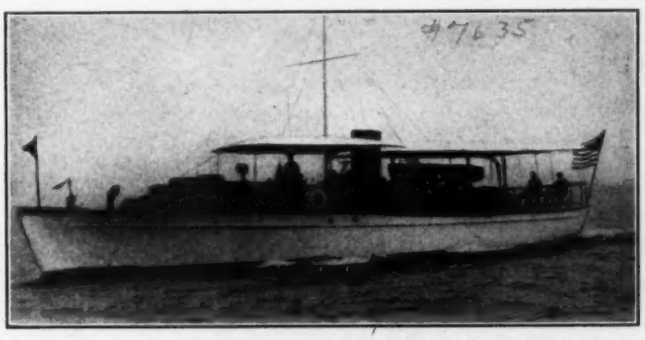
No. 8986—Sale—Modern, fast day Cruiser, 55 ft. x 8 ft. 9 in. x 3 ft. Speedway motor. Speed 22 miles.



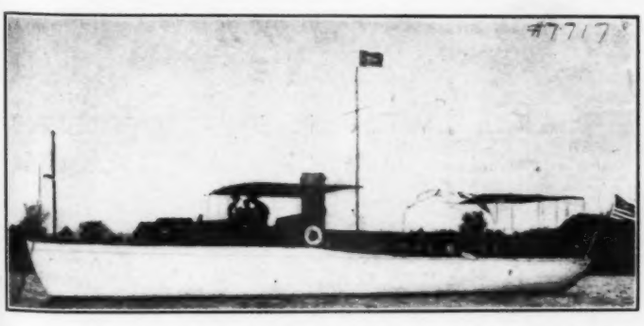
No. 18—For Sale—Estate anxious to sell fast cruising steam yacht, 147 ft. x 17 ft. x 7 ft. 3 staterooms, bathroom, dining saloon, sitting room.



No. 8662—Sale—Twin Screw Cruiser. Speedway motors, new 1916. Speed 15 miles. Stateroom, saloon, large cockpit and bridge deck.



No. 7635—Sale—Cruising Motor Yacht, 66 ft. x 13 ft. 4 in. x 4 ft. Standard motor. 2 staterooms, bathroom, saloon, etc.



No. 7717—Sale—Raised Deck Cruiser, 60 ft. x 11 ft. x 3 ft. 6 in. 50 H.P. Speedway motor. Saloon, stateroom, galley, etc.

No. 8713—For Sale—Attractive Day Cruiser, 50 ft. x 8 ft. 3 in. x 3 ft. 1 in. draft. 6 cylinder Holmes motor. Speed 13 miles.

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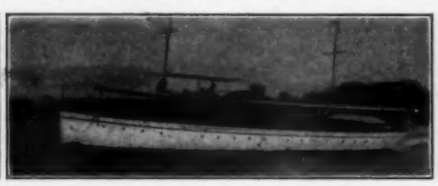
No. 2958—For Sale—High grade express steam yacht. 120 feet. Twin screw. Speed up to 24 miles. In fine shape. Gielow & Orr, 52 Broadway, New York City.

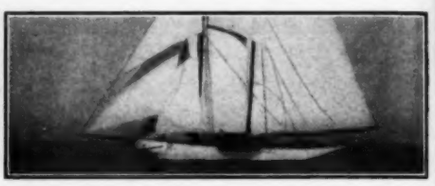
No. 5488—For Sale—64 foot express cruiser. In excellent condition. Can be purchased at bargain. Act quick. Make inspection immediately. Gielow & Orr, 52 Broadway, New York City.

No. 4591—For Sale—126 foot twin screw steel motor yacht. Most successful cruiser. Designed by us. Five staterooms. Speedway engines. Gielow & Orr, 52 Broadway, New York City.

No. 4331—For Sale—Lawley built 68 foot twin screw power yacht. Mahogany and butternut interior finish. Two staterooms. Gielow & Orr, 52 Broadway, New York City.

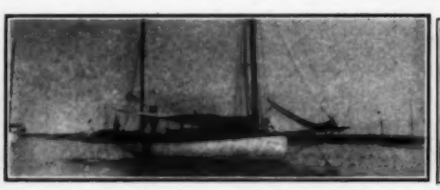


No. 3710—For Sale—Popular twin screw off shore cruiser. 99 foot by 17 foot by 4 foot. Standard motors. Six staterooms, three bathrooms. Gielow & Orr, 52 Broadway, New York City.

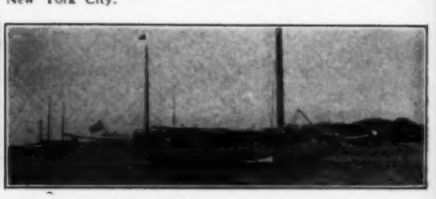


No. 1603—For Sale—Auxiliary keel schooner, 69 foot overall, 45 foot waterline, 15 foot beam. 9 foot 6 inches draft. Two staterooms. Flush deck and cockpit. Gielow & Orr, 52 Broadway, New York City.

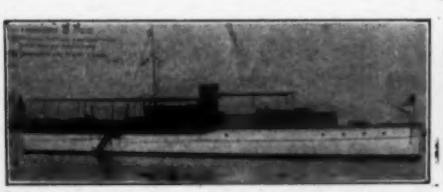
No. 5969—For Sale—Built 1917. Handsome 65 foot motor yacht. Sterling engine. Two staterooms, bathroom. Mahogany finish inside. Gielow & Orr, 52 Broadway, New York City.



No. 2841—For Sale—Auxiliary centerboard yawl. 35 feet overall, 30 feet waterline, 12 feet beam, 3 feet 3 inches draft. In excellent condition. Sterling engine. Gielow & Orr, 52 Broadway, New York City.



No. 706—For Sale—Most attractive 71 foot auxiliary keel yawl. Sails new 1916. Fast sailer. Three staterooms. Price reasonable. Gielow & Orr, 52 Broadway, New York City.

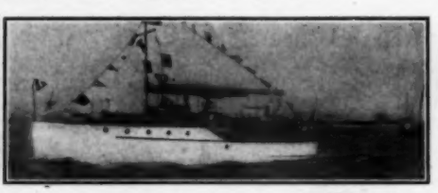


No. 6053—For Sale—Handsome 75 foot twin screw motor yacht. Built 1917. 20th Century motor. Mahogany and white. Three staterooms. Gielow & Orr, 52 Broadway, New York City.

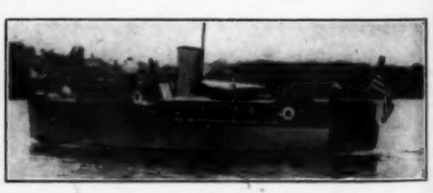
No. 5951—For Sale—High grade 40 foot express cruiser. Hand V bottom. Speed up to 23 miles. Van Blerck engine. Gielow & Orr, 52 Broadway, New York City.

No. 5957—For Sale—This popular 51 foot raised deck motor yacht. Elco build 1917. Sterling engine. Private stateroom. Gielow & Orr, 52 Broadway, New York City.

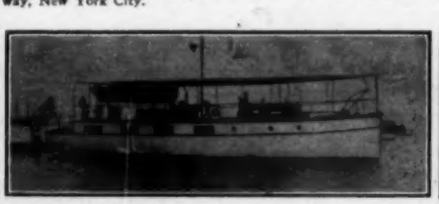
No. 5616—For Sale and Charter—Finest kept up 122 foot steel steam yacht. Triple expansion engines. Five staterooms. Two bathrooms. Worth investigating. Gielow & Orr, 52 Broadway, New York City.



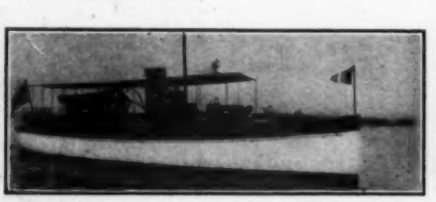
No. 6049—For Sale—This fine little 38 foot cruiser. Can be purchased right. Private stateroom. Buffalo motor. Gielow & Orr, 52 Broadway, New York City.



No. 5980—For Sale—This 60 foot express yacht built 1917. Equipped with Sterling engine. Speed up to 16 miles. Gielow & Orr, 52 Broadway, New York City.



No. 5225—For Sale—52 foot flush deck cruiser. Standard motor. Private stateroom. Bathroom. Excellent proposition. Estate must be settled. Gielow & Orr, 52 Broadway, New York City.



No. 6061—For Sale—50 foot Luders build raised deck cruiser. Van Blerck engine. Most attractive proposition. Gielow & Orr, 52 Broadway, New York City.

No. 235—For Sale—66 foot auxiliary centerboard yawl. Two staterooms. Sterling engines. Inspection invited. Gielow & Orr, 52 Broadway, New York City.

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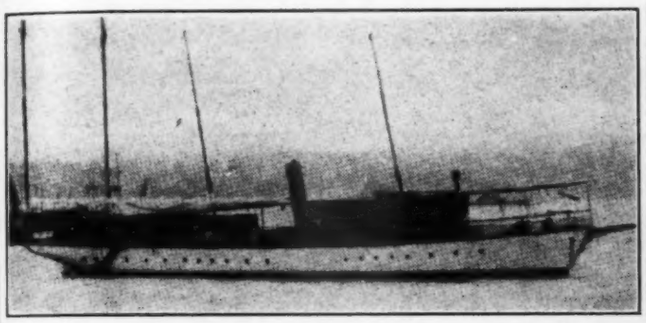
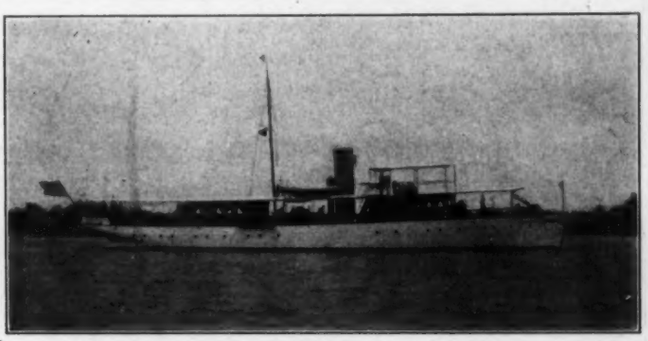
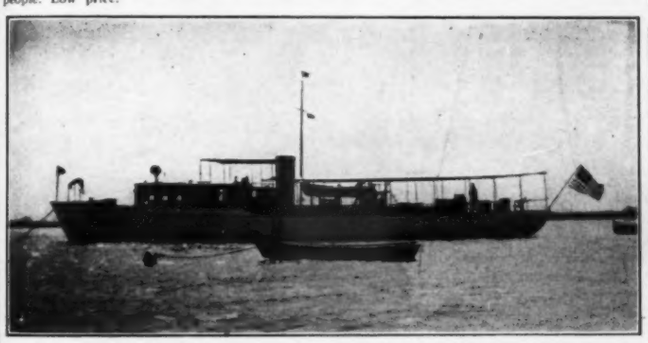


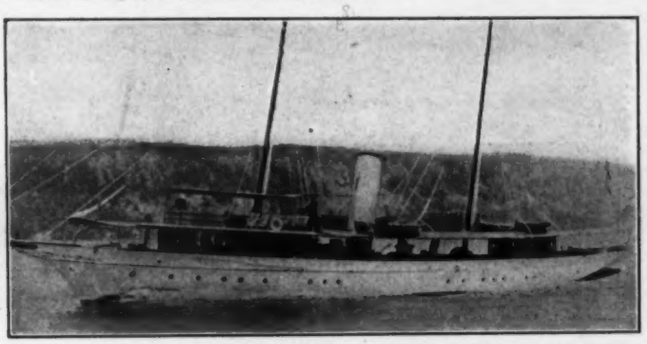
No. 2381—Flush deck, 105 ft. Power Yacht, 100 H.P. motor installed 1915, sleeps 10-12 people. Low price.



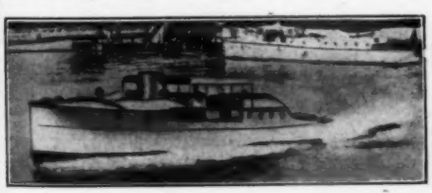
No. 646—For Sale or Charter—Steam yacht 123 ft. x 17 ft. x 6 ft. draft. 5 staterooms, 3 bathrooms. Dining saloon and social hall on deck.



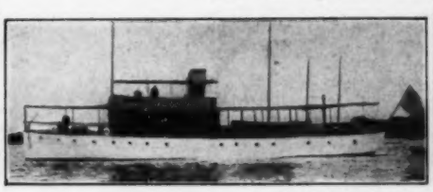
No. 1081—For Sale—Twin screw, 90 ft. power yacht; splendid accommodation. Recently overhauled and 2 new Standard engines, 4 cylinder, 75 h.p. each, installed 1916. Exceptionally able and fully found.



No. 238—For Sale—Steel steam yacht, 170' x 21' x 8' draft. Large dining saloon, social hall and smoking room on deck; 5 staterooms, 3 bathrooms, etc. Completely equipped.

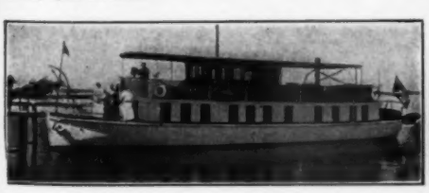


No. 2314—Express cruiser, 50 x 11.3, Van Blerck 200 H.P. motor, speed 22 miles.

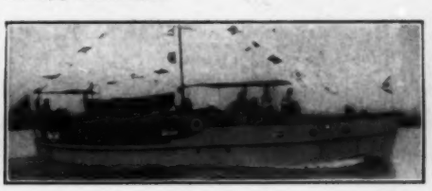


No. 1821—Flush Deck Power Yacht, 90 x 15.3, two 60 H.P. motors, 3 staterooms, etc.

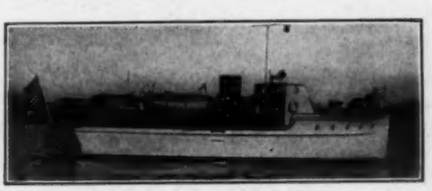
No. 924—Power Yacht, 92 ft., 100/125 H.P. 20th Century motor, splendid deck space.



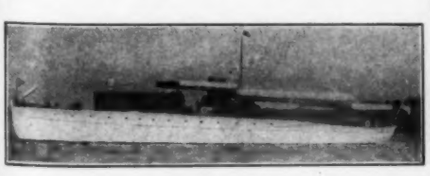
No. 37—Offered by Estate—Florida waters—70 ft. shoal draft houseboat, two Sterling motors, three staterooms, etc.



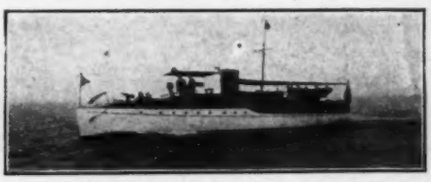
No. 2355—Bridge deck cruiser, 43 x 9.6, Lamb motor, 24 H.P.; quick sale desired.



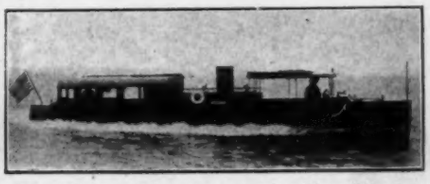
No. 2386—New Patrol type, 54 x 11.2, eight cylinder Van Blerck, speed 17 miles.



No. 1937—Diesel Power Yacht, 110 x 18, two 6 cylinder 150/180 H.P. engines, low fuel cost.



No. 1738—Raised Deck Cruiser, 65 x 11, six cylinder motor, good accommodation.



No. 2358—New Express Cruiser, 45 ft., eight cylinder, 200 H.P. Van Blerck, speed 22 miles.

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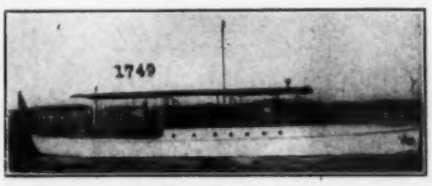
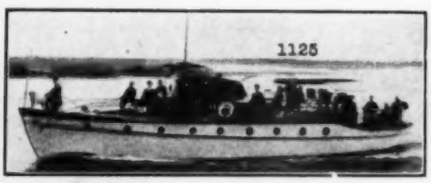
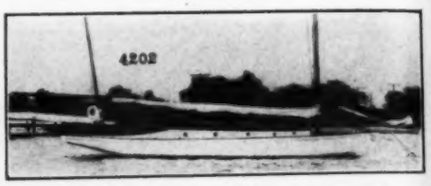


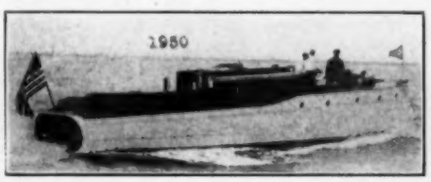
1749—75 foot twin screw power yacht similar to cut. Three staterooms, main cabin, bath, etc. Speed 10 miles.



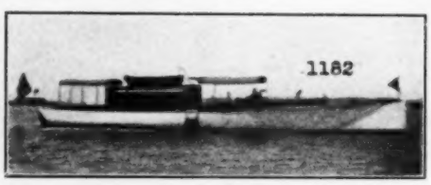
1125—60 foot cruiser. Two double staterooms. Large saloon, etc. Speed 12 miles.



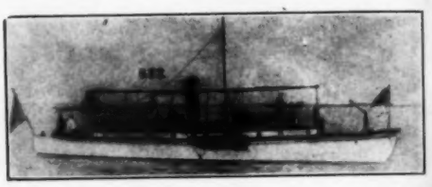
4202—47 foot auxiliary yawl. Stateroom and saloon with four berths. Speed 7 knots. $500 will buy her for quick sale.



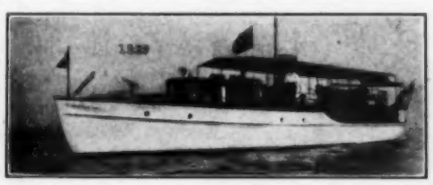
1950—50 foot V-bottom express cruiser. Sleeps four in owner's party. Speed 22 miles.



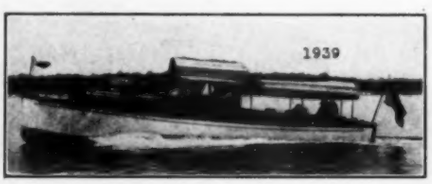
1182—55 foot express day cruiser. Speed 22 miles. Bargain.



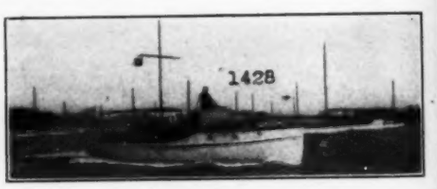
852—65 foot power cruiser. Two staterooms, saloon, bath, etc. Speed 12-13 miles.



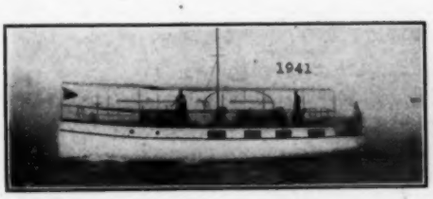
1529—65 foot power yacht. Double stateroom, main cabin, dining saloon, bath, etc.



1939—40 foot V-bottom express cruiser. Sleeps two. Speed up to 22 miles.

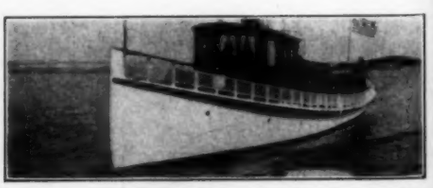


1428—42 foot cruiser. Double stateroom and cabin. Sleeps six people. Speed 10-11 miles.

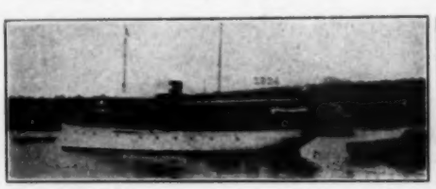


1941—52 foot houseboat cruiser. Large saloon and double stateroom, etc. Speed 9 miles.

4258—107 foot power houseboat; built 1918. Six staterooms, dining saloon, living room, four bathrooms, etc.

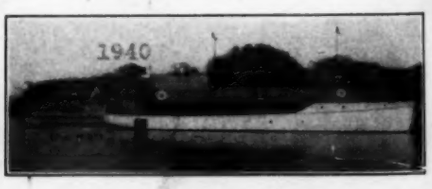


4217—75 foot steam yacht. Strongly built. Good condition. Speed 10-12 knots. Suitable for commercial purposes. Price attractive.

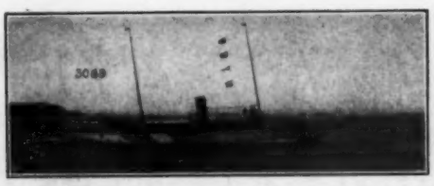


1924—90 foot twin screw power yacht. Three staterooms, dining saloon, bath, etc. Speed 14 miles.

1934—32 foot cruiser. Sleeps four. 18-25 H.P. Sterling motor Price attractive.

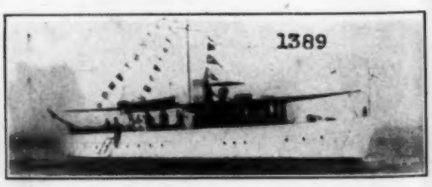


1940—65 foot cruiser. Three double staterooms, saloon, bath, etc.



3068—150 foot steel steam yacht. Splendid accommodations. Speed 18 miles.

2376—175 foot steam yacht. Eight staterooms, social hall, dining saloon, main saloon, baths, etc.



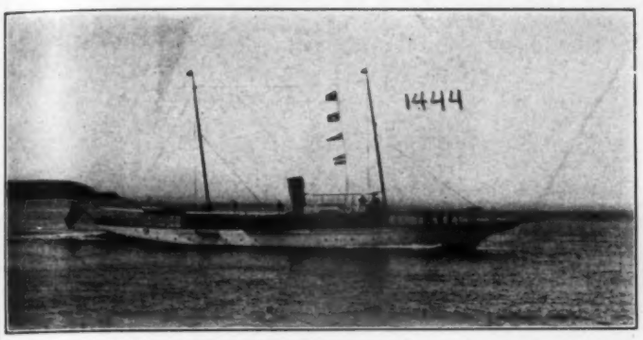
1389—90 ft. power yacht. Twin screw. Three staterooms, saloon, bath, etc. Speed 12-14 miles.

FRANK BOWNE JONES, Yacht Agent

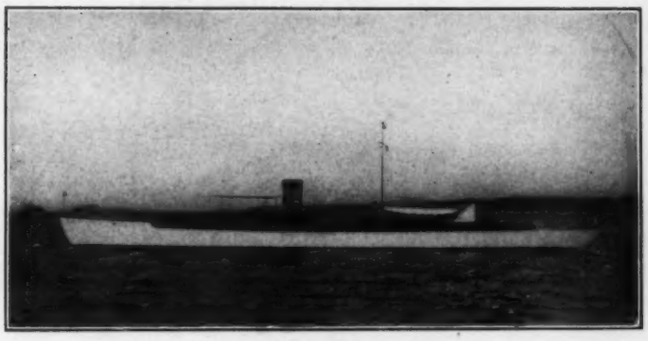
Cable Address "Windward," N. Y. **29 Broadway, New York** Telephone, Whitehall 480

High-Class Yachts of all types for sale and charter

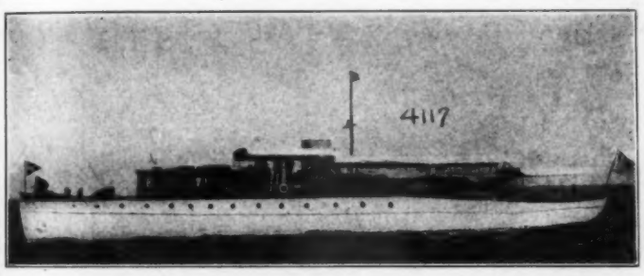
NAVAL ARCHITECTURE Let us know your requirements MARINE INSURANCE



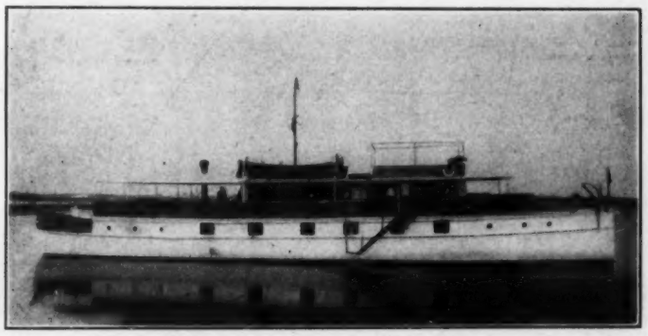
No. 1444—For Sale or Charter—Steel steam yacht; length 145 ft.; best design and build; Speed 16 knots; A-1 condition. Frank Bowne Jones, Agent, 29 Broadway, New York.



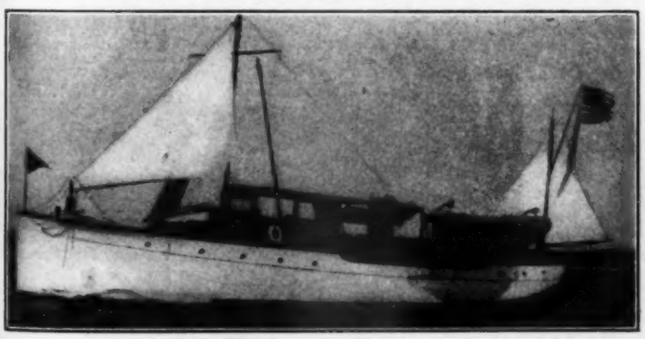
No. 4430—Express Steam Yacht; length 112 ft.; twin screw; built by Herreshoff Manufacturing Co.; speed up to 25 miles; good as new. Frank Bowne Jones, Agent, 29 Broadway, New York.



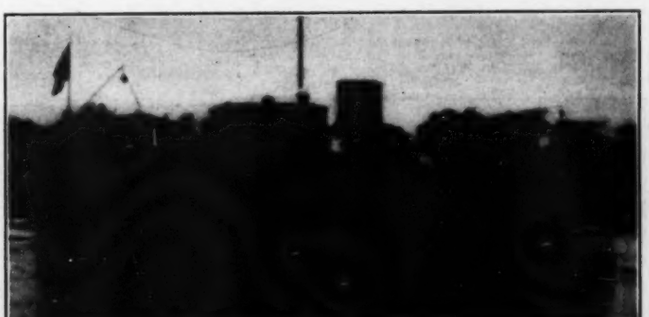
No. 4117—Sea-Going Power Yacht; length 110 ft.; twin screw; two Diesel engines; excellent accommodations; desirable vessel in every particular. Frank Bowne Jones, Agent, 29 Broadway, New York.



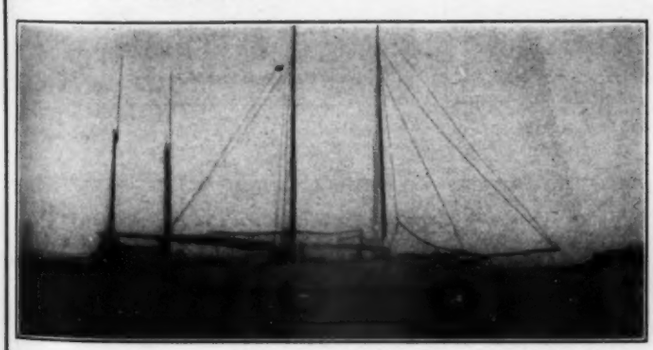
No. 1138—For Sale or Charter—100 ft. Power Houseboat; built last year; splendid accommodations; 100 H.P. motor. Frank Bowne Jones, Agent, 29 Broadway, New York.



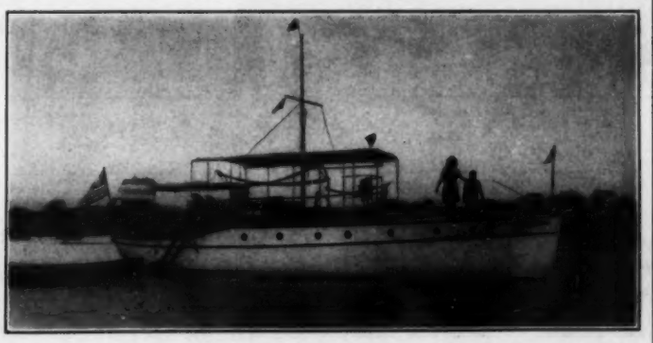
No. 4079—Gasoline Cruiser; length 70 ft.; built by Lawley; three years old but little used; 6 cylinder Winton engine; has auxiliary sail power; very desirable yacht. Frank Bowne Jones, Agent, 29 Broadway, New York.



No. 3380—Express Cruiser; length 55 ft.; built last year; Duesenberg motor; speed 28 miles; best boat of the type. Frank Bowne Jones, Agent, 29 Broadway, New York.



No. 4724—Auxiliary Schooner; 43 ft. w.l.; designed by Morgan Barney; modern build; reasonable price; would be delivered to purchaser in commission. Frank Bowne Jones, Agent, 29 Broadway, New York.



No. 390—Raised Deck Cruiser; length 50 ft.; Seabury build; Speedway motor; excellent accommodations. Frank Bowne Jones, Agent, 29 Broadway, New York.

Telephone 969 Vanderbilt
Cable Address "Yachtsan," N. Y.

Yacht Appraiser
Vessel Broker

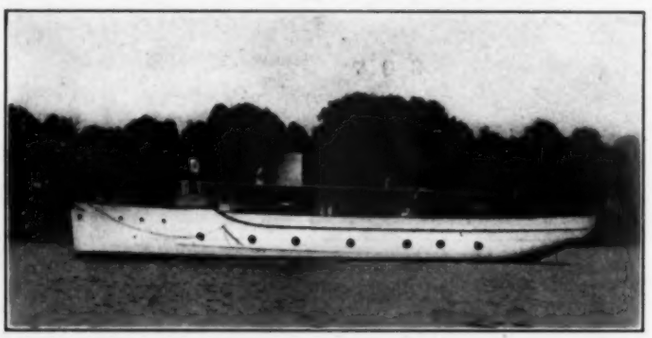
HARRY W. SANFORD

Yacht Broker

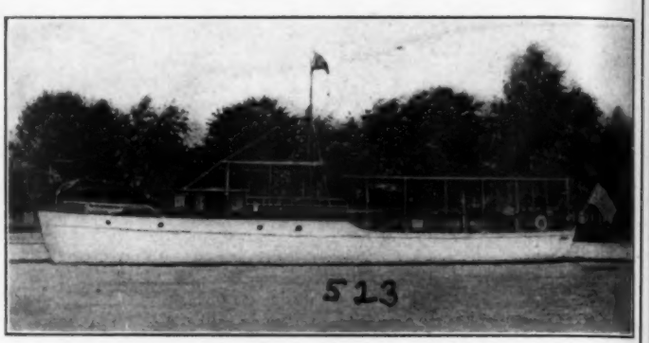
501 Fifth Avenue at 42d Street, New York

Desirable yachts of all types for sale and charter

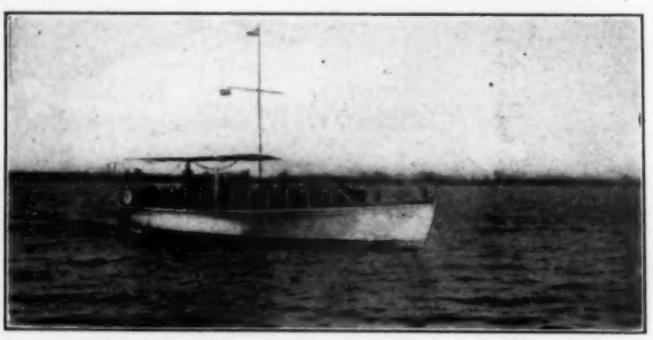
Our central location; our efficient service; the high class yachts offered and sold characterize the HOUSE OF SANFORD



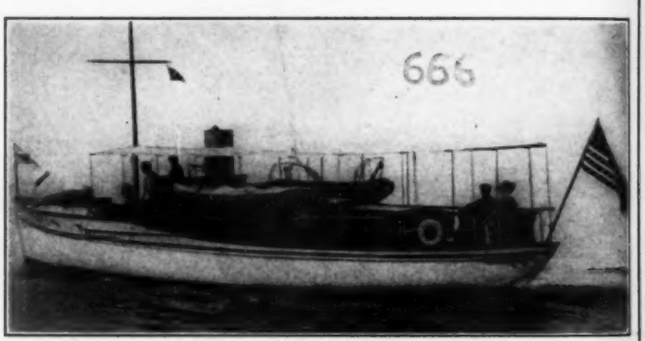
No. 703——Sea Going Cruiser—Length 88 ft.; Twin Screw; 2 double staterooms, 1 bathroom; speed 14 miles.



No. 523—Cruiser—Length 60 ft. Single screw. Sleeping accommodations for 4 persons; speed 11 miles.

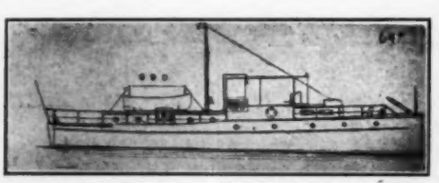


No. 692—For Sale or will exchange for larger yacht. No. 692 is 54 ft. in length, twin screw; sleeps 8 persons; speed 12 miles.



No. 666—60 ft. Cruiser in excellent condition; 1 double stateroom; 2 berths in saloon; speed 11 miles.

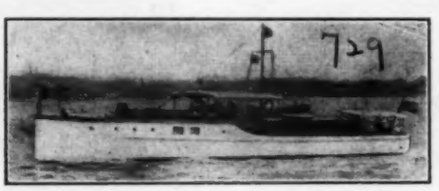
No. 736—60 ft. Cruiser; 3 staterooms, 1 bathroom; speed 12 miles.



No. 690—54 ft. Cruiser; 2 double staterooms; speed 12 miles.

No. 726—55 ft. Express Cruiser; sleeping 8 persons; speed 25 miles.

No. 766—40 ft. cruiser; sleeping 4 persons; speed 14 miles.



No. 729—63 ft. Express Cruiser; sleeping 5 persons; speed 18 miles.

No. 736—45 ft. Elco Cruiser; sleeping 6 persons; speed 11 miles.

No. 521—37 ft. Houseboat; 3 double staterooms; speed 7½ miles.

No. 355—21 ft. Semi-Speed Boat; speed 12-14 miles.

No. 590—25 ft. Speed Boat; speed 22 miles.

THE MOTOR BOATING MARKET PLACE

The rate for "For Sale" and "Want" advertisements is 3 cents per word, minimum 75 cents. If an illustration is used, the charge is as follows, which includes the making of the cut:
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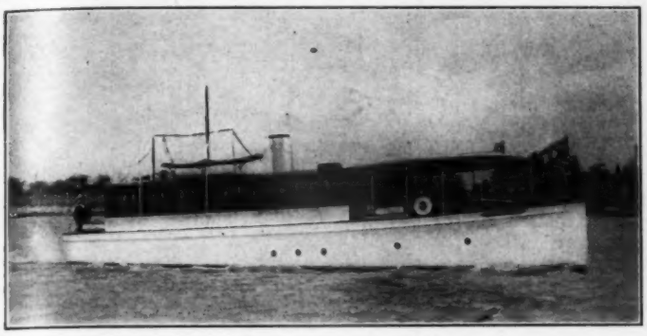
Opportunities for the Motor Boatman

Before you buy or before you sell examine the exceptional buying and selling opportunities under the heading. They comprise the best offer of the month. Please mention MOTOR BOATING.

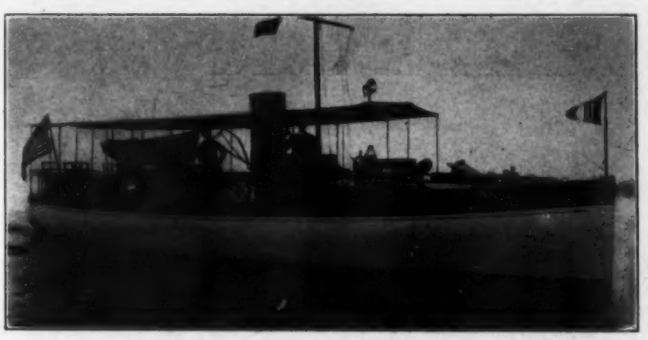


Cabin Cruiser 65 ft. x 12 ft. x 3 ft. 9 in. 6 cylinder Sterling engine 85 to 145 H.P. Electrically equipped thruout. Speed 14 m. 2 staterooms and 16 ft. saloon, luxuriously furnished, 2 toilets, galley and large stowage space. Complete outfit of silver, china, linens, etc. Fully equipped, including power tender. Water tank 75 gal., gasoline 400 gal.
Frames, white oak 1⅜ in. x 2¼ in. spaced 10 in., planking, Louisiana cypress 1¼ in., fastenings copper and brass. Built at a well known plant and launched in July, 1917. Price $12,000.00 for quick sale. Inspectable at Toledo, Ohio. O. W. Nelson, 420 Gardner Bldg., Toledo, Ohio.

FOR CHARTER

120 FOOT STEEL POWER YACHT. TWIN SCREW, HIGH SPEED MOTORS. LUXURIOUSLY APPOINTED THROUGHOUT. TWO DOUBLE STATEROOMS AND TWO BATHS. TO BE IN COMMISSION MAY 15TH. CAN BE INSPECTED THROUGH CAPTAIN ASKLAND, C/O SEABURY & CO., MORRIS HEIGHTS, N. Y.

Here's a real bargain:
Eighteen foot, six passenger, luxurious pleasure launch. Hull finished in white enamel, decks chocolate brown, woodwork and trimmings, grained oak. Khaki auto top, front section instantly collapsible for passengers' convenience, side and rear curtains, spray hood. Imitation leather rear seat and back, four wicker chairs, electric lighting system complete, head and rear white, port and starboard red and green, solid brass rails all round, twin cylinder six H.P. Gray motor with reverse gears, auto control mounted on hand carved oak bulkhead. Sectional boat house built to last a life time, mounted on pontoons, take down and store in winter without using a nail or screw. Outfit cost me $968. I can't use it and it's yours for $450. Write me for further information and photographs. S. J. Van Kuren, Cedar Rapids, Iowa.



FOR SALE—No. 20—The finest 50 ft. cruiser available. Built 1915 for present owner at cost of nearly $17,000. Stateroom and saloon berth 4 comfortably. Two toilets. Beautiful interior. 65-85 h.p. Van Blerck engine new 1916 (hardly used). Speed 14 miles per hour. Fully equipped. Can be operated with one paid hand. Condition good as new. Must be seen to be appreciated. Will be sold for about half of cost. In commission. Apply to Simon Fisch, Yacht Broker, 31 East 27th Street, New York. Telephone Madison Sq. 4008.

Motor Boat for sale—Thirty feet long, Mahogany deck and trim, 50 horsepower Van Blerck engine. Seating capacity 11. In splendid condition, apply H. Howard Shaver, 157 Bay Street, Toronto.

GLASS CABIN CRUISER 41 x 8 feet actual H. P. 40. Built of sassafras throughout, excellent condition. Sacrifice for immediate sale, change of residence forces sale. Captain Boke, Muscatine, Ia.

FOR SALE—Forty foot sailing sloop "Yankee Jack." Can be seen at Jamaica Bay Yacht Club. For particulars phone Owens, 635 Chelsea.

Cottages for rent or sale. Also number of used boats and engines. Prices attractive. Correspondence solicited. Sheldon Cole, Oden, Mich.

As we urgently need all available space at our works, we will dispose of several launches and hulls at very low figures:
66 ft. 6 in. high speed type, triple-planked, mahogany-finished hull.
45 ft. double-planked 20 m.p.h. open launch, with 50 h.p. motor.
25 ft. x 6 ft. double planked, speed hull
and several other attractive boats. Call at Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, New York City.

FOR SALE—Runabout Motor-boat—Brooks V-Bottom Model. Length 25 feet, oak frame, Cypress planking, galvanized and brass hardware, Overland four cylinder automobile engine, 30 Horse Power, turn a 22-in. Bryant and Berry special speed propeller. Engine located near front, rear starting device, reverse gear. Packard auto top, side curtains, windshield. Copper colored bottom, inside woodwork finished in walnut color. Will seat ten comfortably. Appointments perfect. Used but one season. Built to order. Will be sold for $200. Address W. H. P. Gilmore & Co., Turners Falls, Mass.

Going to France—Must sell my 32 foot solid mahogany speed runabout at once—boat and engine just overhauled—ready to be launched. Original cost $5,000.00—after seeing, make best cash offer. Inquire—Am. Halsted, Milton Point, Rye, N. Y.

21 x 6 half glass cabin boat fully equipped two cylinder Fulton motor, excellent condition. Will demonstrate. Bargain. Box Ideal, MoToR BoatinG.

1	H.P. Pierce	$22
2½	H.P. Giant	32
3	H.P. Pierce	38
5	H.P. Termatt-Monahan	45
12	H.P. Barber heavy duty with propellor equipment complete	95

ALL THE ABOVE ARE SINGLE CYL. ENGINES.

6	H.P. Gray two cyl.	$65
10	H.P. Truscott two cyl. and propellor	115
18	H.P. Superior two cyl. heavy duty with propellor	135
30	H.P. Barber 3 cyl. 4¾ x 4¾ speed boat engine with Bosch high tension magneto	145
24	H.P. Waterman 4 cyl. 4 x 4 speed boat engine	115
4	cyl. four cycle 6½ x 8 heavy duty, no gear or propellor. Nearly new	485
6	cyl. KISSEL 4 x 4½ auto engine with electric starter and generator.	

Also hundreds of other four and six cyl. auto engines in all sizes and makes. Large stock of magnetoes, coils, carburetors, oilers, etc., at very low prices.

BADGER MOTOR COMPANY, Milwaukee, Wis.

USE "SNAPPER" ENGINES for your small boat. They are a big little engine built by The Automatic Machine Co., Bridgeport, Conn.

A few medium and high speed, one, two, four and six cylinder, four-cycle marine motors, new or rebuilt. Reliance Motor Boat Co., 210th Street and Harlem River, New York City.

Racine Runabout Motor Boat, 19 ft. long, 18 M.P.H., 16 H.P. Pierce-Budd engine; Special Cushions; Mohair Top; Full Equipment. Just overhauled and ready for water. Guaranteed. Correspond with S. J. Glunt, 631 5th St., Huntington, W. Va.

DON'T SCRAP YOUR ENGINE ON ACCOUNT OF SCORED CYLINDERS OR POROUS HOLES.

We repair them by our Patented Process—fusing a silver and nickel alloy electrically without warping or enlarging the bore. Write to our nearest plant. L. Lawrence & Co., New York, 546 W. 45th St.; Detroit, 1246 E. Jefferson; Chicago, 1522 Michigan Ave.; Newark, N. J., 292 Halsey St.

RUNABOUT For Sale—Handsome 30 ft., semi-speed runabout, practically new, mahogany finish; a real boat for rough weather; 4-cycle, 4-cylinder Van Blerck engine, 40-50 h.p., Bosch dual; speed 21 miles; built by Kretzer Boat Co., New York. Charles T. Lamb, 91 Reid Ave., Brooklyn, N. Y.

WANTED—Boat builders, cabinet makers, joiners, and good first-class house carpenters. Our shops are sanitary, well ventilated, steam heated and the working quarters are excellent. Port Clinton is located on the shore of Lake Erie, midway between Toledo and Cleveland, on the main line of the New York Central Railroad. Non-union shop. We offer good wages, steady work, and transportation will be refunded. Write us if you want a good job, with good pay. Matthews Boat Co., Port Clinton, Ohio.

GENUINE BARGAINS

One 15-28 H.P. 4-cyl, 4-cycle Fay & Bowen Engine, 4 in. bore, 5¼ in. stroke, Bosch magneto; Fay & Bowen reverse gear; used less than two months. Guaranteed equal to new. Price, $600.
One 30-45 H.P. 4-cyl. 4-cycle Fay & Bowen Engine, 5 in. bore, 6¼ in. stroke; same equipment as above; perfect condition. $900. Marine Equipment & Supply Company, 610 Arch Street, Philadelphia, Pa.

Launches, rowboats, big bargains, new samples and second-hand in all sizes. Several engines, all sizes. Send for list. Everett Hunter Boat Co., Dept. B, McHenry, Ill.

BARGAIN FOR CASH—Raised deck cruiser, 38 feet, 20 H.P. Twentieth Century engine, complete cruising inventory, sleeps six. $1,200. Landy, 30 Church St., N. Y.

BOSCH MAGNETOS: 4 and 6 cylinder $10.00 each. Low tension Magnetos $3.50 each. Lighting Generators $8.00 each. Schebler, Rayfield and Stromberg Carburetors $5.00 and $8.00 each. Auto Motors, air and water cooled, suitable for all purposes $30.00 each and up. Write for new bulletin. Johnston, West End Pittsburgh, Pa.

CANADIANS, Second-hand engine bargains. Send for list. GUARANTEE MOTOR COMPANY
73 Bay Street, North Hamilton, Ont., Canada

Trimount Whistle Blower Outfits
Blower runs by friction contact with engine flywheel. Whistle of brass, nickel-plated.
Made in 3 sizes.

Trimount Rotary Hand Bilge Pumps
All bronze composition. Suction lift 6 to 20 feet. A lifelong convenience.
Made in 3 sizes.

TRIMOUNT ROTARY POWER CO.
20 Heath Street Boston, Mass.
(Factory: Whiting Ave., East Dedham, Mass.)

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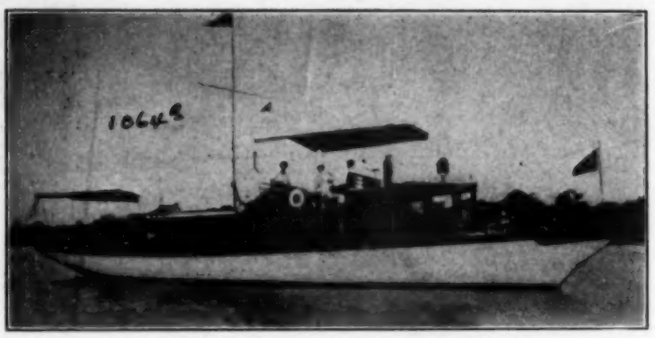
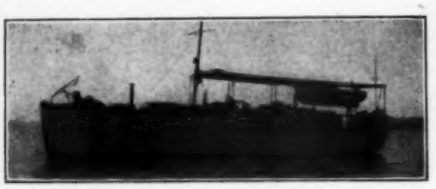


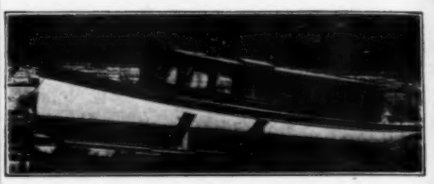
No. 1064—Offer wanted—Particularly desirable motor yacht; 63 x 12.6 x 3.10 ft. Speed 11-13 miles; 50/54 H.P. 6 cyl. Standard motor. Accommodations for six on berths in pilot house and large saloon. Mahogany finish throughout. Independent electric lighting plant. Large deck space. Cox & Stevens, 15 William Street, New York.

FOR SALE—No. 18—An exceptionally fine 45 ft. cruiser, built 1914. Stateroom and saloon berth 4 comfortably; 2 toilets. Handsome interior. 65-75 h.p. 6 cylinder Wisconsin motor installed 1916; speed up to 12 miles per hour. Fitted with self starter and Dual ignition. Full cruising inventory. Price attractive for immediate sale or will consider high speed first class runabout in exchange. In commission. Address Simon Fisch, Yacht Broker, 31 E. 27th St., New York. Telephone Madison Sq. 4008. (Formerly 17 years with Stanley M. Seaman.)

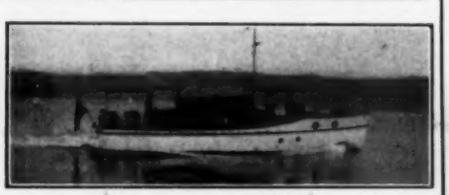
No. 21—For Sale at a sacrifice this handsome 25 ft. V-bottom Hand designed runabout, built 1916 at cost of over $4,500. Latest type 65-85 h.p. Van Blerck motor; speed 32 miles per hour. Whole outfit put in first class order 1917. Any reasonable offer entertained for immediate sale. Address Simon Fisch, 31 East 27th Street, New York. Telephone Madison Sq. 4008.



No. 9—Here is an opportunity to purchase this well known type of 45 ft. ELCO de-Luxe Cruising Yacht at an attractive figure separate stateroom with toilet. Separate saloon. Guests' toilet room. Mahogany interior. Bridge control of 32-37 h.p. Standard motor; can be handled with one paid hand any time. Fully furnished. Condition good as new. Apply to Simon Fisch, Yacht Broker, 31 East 27th St., New York City. Telephone Madison Sq. 4008. (Formerly 17 years with Stanley M. Seaman.)



FOR SALE—Glass Cabin Cruiser, 34 ft. Morris Heights build. Entire cabin and toilet room solid mahogany. Sleeping accommodations for six. 4 cyl. Panhard & Levassor engine (engine cost $3200). Pilot wheel control. Fully equipped for cruising with "Dandy Dink". Perfect condition guaranteed. Cost over $7000, will sell for $2200. W. E. Church, 340 Broadway, New York City.



FOR SALE—Forty foot Bridge Deck Cruiser, Iris 2nd, 5 years flag ship and cup winner Albany Yacht Club. Cost $4500—Will sell for $2000. Perfect in every detail. In Commission May 1. Inspection and inventory. Matt McCarty, 26 William Street, Albany, N. Y.

FOR SALE—26 ft. mahogany runabout. Fay & Bowen 35 H. P. engine. Electric lights. McClellan one man top. Complete equipment. Speed 18-20 miles. Cost over $2000, will sell for $1000. Write for particulars W. O. Bixler, Easton, Pa.

FOR SALE—Owner has gone to the Front—Sea-worthy Cruiser. Brooks V-bottom Model Glass cabin cruiser, 25 feet long, oak frame, Cypress planking, all hardware, brass and galvanized, front seat and two couches in cabin, seat for three in after-deck. Pierce-Budd four cylinder marine motor, 40 horsepower, two speed forward and one reverse. Con coil. Capacity of tank 40 gallons of gasolene. Boat built for salt water. Woodwork finished cherry color inside, white outside. All in perfect condition. Built to order in 1916. Will be sold for only $300. Address W. H. P. Gilmore & Co., Turners Falls, Mass.

FOR SALE—Passenger or Pleasure Steamer "Ramona" 72 x 16½ x 3½ ft. Model Bow; Stern wheel. Electric Plant with search light, 250 H.P. 8 cylinder 7½ x 6½ Buffalo; Cost $16 good as new; will sell cheap, with or without machinery. Write Frederick W. Pfaff, 2713 West 6th St., Cincinnati, Ohio.

BARGAINS.

Each year we offer a few bargains in motor boats. This year our list is the smallest we have ever presented, but what we offer is quite worth while.

W. A cruiser of great excellence. Fitted with every convenience. Remarkably well found. Ample accommodations for eight and crew. Extra spacious deck room. Able in any weather. Speed 13 miles. (53' x 11'10" x 3'2".)

X. A runabout, V-bottom (24 ft. 10 in. x 5 ft. 4 in. x 2 ft. 1 in.), designed by a leading Naval Architect, Powered with Sterling Engine. Speed about 19 M.P.H. Extremely good sea boat.

Y. A runabout, Dory style (25 x 6 x 1½). A sturdy, safe boat, powered with Grant Ferris Engine. Speed about 12 M.P.H. Fine rough water boat.

CONODOGUINET CONSTRUCTION CO., Carlisle, Pa.

Outboard Motors At Cost—Battery models, $44.00, magneto flywheel or Bosch $56. Caille and others. New, jobber's overstock. Must sell to make room for other goods. H. P. Henderson, 40 East Oak St., Chicago.

FOR SALE 26 ft. Open Launch with hood	$225.00
15 ft. Glass Cabin Launch	200.00
2 H.P. Wisconsin little used O. Board Motor	40.00
2 H.P. Farro little used O. Board Motor	60.00
1 H.P. Farro	35.00
1-4 Gaffaga	40.00

E. W. Bennett, Southampton, N. Y.

31 x 6½ comfortable family runabout, splendid condition, will sell with or without six cylinder Sterling engine. Wm. Bruns (personal), 115 Liberty St., New York City.

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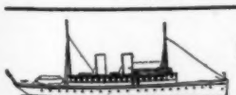

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Teaching the Yachtsman Naval Seamanship

(*Continued from page 20*)

ages sent on paper; then the shape signals are explained in the same manner as the code flags. The shades used are the regulation squadron shapes, single and double cones and two cylinders called by our men Mutt and Jeff, one being long and slender while the other is short and thick. These are made of bunting and sewed in over rattan hoops which overcome the objection of weight found in the shapes made with a solid wooden base and also make them collapsible for easy stowing. The rattan rings have the advantage over metal of not rusting.

Next we take the semaphore method of signaling and in teaching this we believe that we have the simplest method (original with our First Lieutenant) possible for instructing in both sending and receiving. I believe this method worthy of a brief description.

The twenty-six letters and the signals—"Letters follow" and "signals follow" can all be found in a double cross of four lines so crossed as to form eight forthy-five degree angles.

Of course it would be confusing to separate these angles into separate letters and signals so the chart has been so arranged as to show each angle by itself.

The letters U N I X are illustrated at the left (see drawing), P B J F at the right, L R and signals follow at the bottom, O T letters follow W H A G and Z at the top and in the center an octagon, the angles of which give you E M S C V Y Q K. A straight vertical line in the center of the octagon gives you the remaining letter D.

The letters are then before you just as they will appear when made by the man sending them, and to use the chart in sending you simply reverse the position and send the opposite of all letters except U N R D which are the same either sending or receiving; we never teach the semaphore in alphabetical order nor do we make a practice of sending connected messages, but rather a lot of jumbled up letters that give no cue as to what the next will be, this seems to be the best method for results.

The next method of signaling is not so easy to use although the memorizing of the alphabet is not difficult, this is called the blinker light.

The one great drawback to the uninitiated is the separation of the letters and the words, and this we believe is largely due to faulty sending and the different kinds of sending peculiar to the man operating the key; to overcome this as much as possible we have a mechanical sending apparatus, also the work of our Lieutenant, by which we can send a reasonably long message at a predetermined rate of speed, and absolutely uniform in its spacing. This is composed of a clock-works controlled by an adjustable governor and fitted with a contact wheel carrying a slotted tracing cloth or record which cuts off and allows the proper contact, so that all letters are the proper distance apart, and all dots and dashes the same length of duration respectively.

This does not make it hard for the beginner to read poor sending, for after he has mastered receiving once, the idea penetrates and he becomes accustomed to the flashes and reads them as letters, not dots and dashes, and he finds it a simple matter to make allowance with perfect confidence for poor sending; of course each one also has their own key and light and take turns at sending as well; a specially important item in blinker light is to teach the student to carry in his mind the letters of a word complete before he writes that word down.

In this work, too, we make use of a special chart; at the left hand of the chart all letters are grouped; at the right hand side the same method is employed with the dashes, with the exception of a few letters which cannot be regularly classified into special groups, which are based on their respective sides under the regular groups, this chart covers the complete alphabet, signals and numerals.

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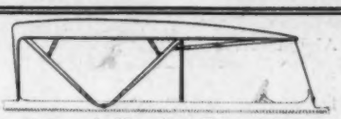

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Practical Navigation for the Motor Boatman

(*Continued from page 35*)

Comp. Course	Var.	Dev.	Error	True C.	Dist.	N	S	E	W
192°	10° W	4° W	14° W	178°	8	—	8.0	0.3	—
88°	10° W	4° W	14° W	74°	43	11.9		41.3	
						11.9	8.0	41.6	
						8.0			
						3.9			

Lat. left.....40° 28.5' N Long. left.....73° 11.1' W
Diff. lat..... 3.9' Diff. long..... 55.0'

Lat. in.....40° 32.4' Long. in.....72° 16.1' W
Mid. lat.....41°

Noon position by dead reckoning:—Lat.....40° 32' N
Long....72° 16' W

Noon sight:—Obs. alt. ☉..30° 31' 30" Table 46..... 11' 20"
Corr. ..... 9' 50" I.C. .....— 1' 30"

Altitude ...30° 41' 20" S 9' 50"

L.A.T. 0h 0m 0s
Long. 4h 49m 4s

G.A.T 4h 49m 4s

90° 00' 00"
Altitude ....30° 41' 20" S Declination Jan. 26 at 4h = — 18° 48.1'

H.D. ..... 0.6'
Zenith dist..59° 18' 40" N Int. ..... 0.8'
Declination .18° 47' 36" S

Corr. ..... 0.5'
Latitude ....40° 31' 04" N

Dec. ..... 18° 47.6' S

Noon position:—Lat.....40° 31.1' N
Long. ..72° 16.1' W

Comp. Course	Var.	Dev.	Error	True C.	Dist.	N	S	E	W
90°	11° W	5° W	15° W	75°	52	13.5	—	50.2	—

Lat. left.....40° 31.1' N Long. left.....72° 16.1' W
Diff. lat..... 13.5' Diff. long..... 1° 7.0'

Lat. in.....40° 44.6' Long. in.....71° 9.1' W
Mid. lat.....41°

P. M. position by dead reckoning:—Lat....40° 44.6' N
Long. .71° 9.1' W

W.T. ..... 4h 00m 20s Obs. alt. ☉....8° 19' 30"
W.T. ..... 4h 00m 50s Obs. alt. ☉....8° 25' 00"
W.T. ..... 4h 01m 23s Obs. alt. ☉....8° 30' 30"

12h 01m 93s Mean .....8° 25' 00"
Mean .....~ 4h 00m 51s
C-W ..... 5h 00m 05s Table 46..... 6' 50"
I.C. ..... —1' —30"
C.T. 9h 00m 56s
C.C. ..... — 3m 18s Corr. ..... 5' 20"

G.M.T. ..... 8h 57m 38s Alt. .....8° 30' 20"
Eq.t. ..... —12m 40s

G.A.T. 8h 44m 58s

Eq.t. at 8h.... = 12m 39.7s Dec. at 8h..... = 18° 45.6'

H.D. ..... 0.5s H.D. ..... 0.6'
Int. ..... 1.0s Int. ..... 1.0'

Corr. ..... 0.5s Corr. ..... 0.6'

Eq.t. ..... — 12m 40.2s Dec. ..... 18° 45.0'
90° 00.0'

Polar distance. 108° 45.0'

Altitude ..... 8° 30' 20"
Latitude ..... 40° 44' 36" log. sec.....10.12052
Polar distance...108° 45' 00" log. csc.....10.02368

Sum .....2)157° 59' 56"
Half sum..... 78° 59' 58" log. cosine.. 9.28065

Altitude ..... 8° 30' 20"

Remainder ..... 70° 29' 38" log. sine.... 9.97433

Log. haversine of the L.A.T..... 9.39918

G.A.T. 8h 44m 56s
L.A.T. 4h 00m 23s

Long. .....4h 44m 35s = 70° 08' 45"
P. M. position:—Lat.....40° 44.6' N
Long. ...71° 9.0' W

Note:—Sights with the sun so low are to be avoided when possible but they are better than no sight at all. Such a close check between the dead reckoning and astronomical work is not to be expected in practice.

Problem 2. On November 16, 1918, the a. m. position by dead reckoning is Lat. 39° 12' N, Long. 42° 03' W, this position being doubtful as no sights have been obtained for several days. An a. m. sight gave the following results: Height of eye 34 ft., I.C. — 30", C-W 2h 50m 16s, C.C. — 1m 51s, the patent log reading 16.3.

W.T. 8h 12m 16s Obs. alt. ☉ 14° 24' 40"
W.T. 8h 12m 46s Obs. alt. ☉ 14° 29' 40"
W.T. 8h 13m 18s Obs. alt. ☉ 14° 34' 50"

From the position of the morning sight a compass course of 87° (Var. 25° W, Dev. 2° W) was held until noon when a meridian altitude was obtained, the log reading 71.3. Obs. alt. ☉ 32° 21' 30" S. Height of eye 34 ft. I.C. — 30".
Find the true noon position.

Solution by backing and filling:—
a. m. position by dead reckoning Lat. 39° 12' N Long. 42° 03' W.
Run from a. m. to noon = 71.3 — 16.3 = 55.0 miles.

Comp. Course	Var.	Dev.	Error	True C.	Dist.	N	S	E	W
87°	25° W	2° W	27° W	60°	55.0	27.5	—	47.6	—

Lat. left.....39° 12.0' N Long. left.....42° 03' W
Diff. lat..... 27.5' Diff. long..... 1° 01'

Lat. in.....39° 39.5' N Long. in.....41° 02' W
Mid. lat.....39°

Obs. alt. ☉.....32° 21' 30" S Table 46.....9' 06"
Corr. ..... +8' 36" I.C. .....—30"

Alt. .....32° 30' 06" S +8' 36"
90° 00' 00"

L.A.T. ..0h 0m 0s
Zenith dist.....57° 29' 54" N Long. ...2h 44m 8s
Declination .....18° 38' 24" S

G.A.T. ..2h 44m 8s Nov. 16

Noon latitude.....38° 51' 30" N
Diff. lat. a. m. to noon... 27' 30"

Correct a. m. lat.....38° 24' 00" N
Dec. at 2h.. = —18° 38.0'

H.D. ..... 0.6'
Int. ..... 0.7'

Corr. ..... 0.4'

Dec. ..... 18° 38.4' S

W.T. ..... 8h 12m 16s Obs. alt. ☉..14° 24' 40"
8h 12m 46s 14° 29' 40"
8h 13m 18s 14° 34' 50"

3)24h 38m 20s 3)42° 87' 130"

Mean .... 8h 12m 47s Mean .....14° 29' 43"
C-W 2h 50m 16s

Table 46.... 6' 50"
C.T. .....11h 03m 03s I.C. ..... —30"
C.C. ..... —1m 51s

Corr. ..... 6' 20"

G.M.T. ...23h 01m 12s Nov. 15
Eq.t. ..... +15m 15s

G.A.T. ...23h 16m 27s

Position at noon:—Lat.....38° 51.5' N
Long. ...40° 47.0' W

(*Continued on page 86*)

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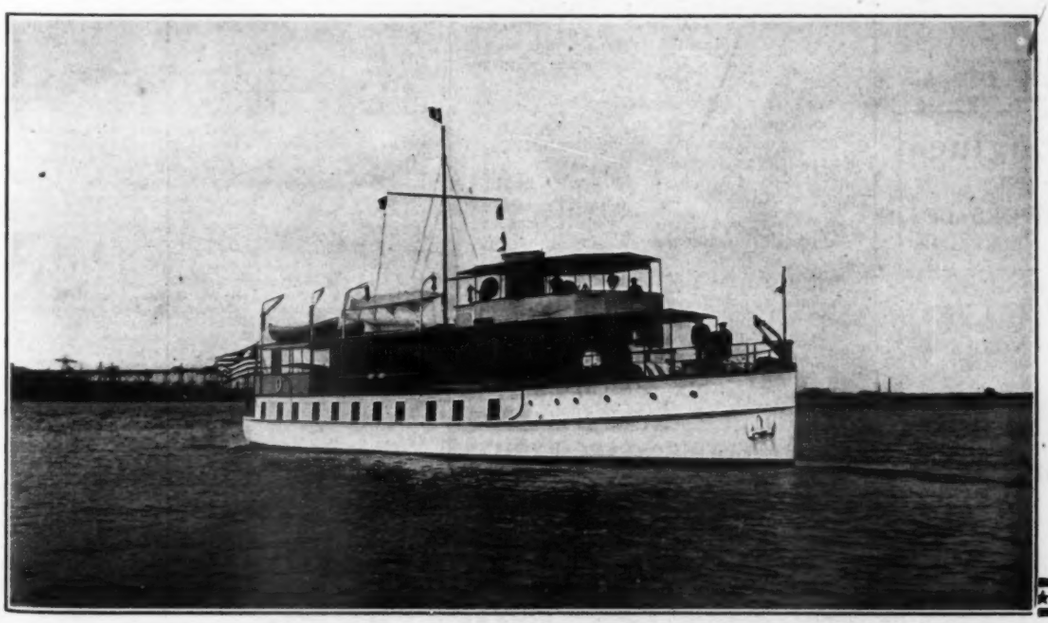

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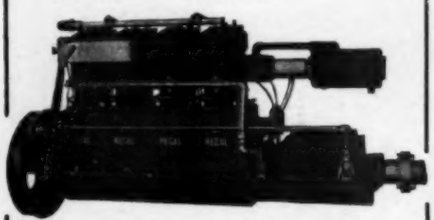

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America's Opportunity

(*Continued from page* 11)

eventually food and ammunition must begin to fail. It takes time to repair railroads, bridges and roads. It takes time to rebuild factories and replace exploded munitions, and how can this be done if day after day, night after night, the bombing is kept up.

The Allies, failing to solve the great question of defeating the Germans have turned to America. Never before, in all history, has one country been called upon to solve the difficulties of nearly all the other countries of the world. They have put it up to America and their eyes are turned towards her in high expectation and hope. Will America fail? She need not. Her answer is—the immediate construction of great fleets of super-bombing machines.

Small machines have their great and intrinsic value, but limited. They assist the land armies, they are not an offensive in themselves. Their great value is for obtaining information regarding the movement and location of enemy troops and defenses, and for directing artillery fire. These machines are in turn protected by other called battleplanes, who escort them and who endeavor to keep the air as clear as possible of hostile aircraft.

But the aeroplane is capable of a far greater expansion than this. We already, to-day, have great numbers of bombing machines, but they are not nearly big enough. There is no limit to the size an aeroplane can be built, as witness the success of the big Capronis and Handley-Page. Both Handley-Page and Caproni agree that these machines are nothing compared to those it is possible to create.

A bomb dropped on a roadway makes a crater which blocks traffic until that crater can be filled. No train can pass on a railway line upon which a bomb has been dropped until the damage has been repaired. While it is being repaired the lines are congesting. Bombs dropped on an ammunition dump may spoil an entire campaign. Witness the bomb dropped by a lone German in the spring of 1916 on the great ammunition dump near Yyres. One German, one bomb, and the entire plans of a great British offensive at Ypres that summer rolled heavenward in a dense column of smoke. All the labor of the winter, the massing of the troops, the moving of the guns from the sectors of the line, the long months of range finding of the artillery in cooperation with the aeroplanes, destroyed by a single bomb. This is a big war and will be won only by big conceptions. So if we would send a thousand great super-bombing machines carrying six 500-pound bombs or even three 1,000-pound bombs a piece, the result can be imagined. 3,000 1,000-pound bombs or 6,000 500-pound bombs would remove the German fleet and the Canal itself from existence.

I have been informed that it would be impossible to ship such large aeroplanes across to any great amount as there is not enough cargo space to ship half the supplies necessary for the troops as it is.

Fine! Fly them across and bring to our Allies America's answer to the U-boat!

To the average person, unacquainted with aeronautics, to fly across the Atlantic seems a huge, a mad undertaking. They can only think of the Atlantic as a vast, mysterious body of water, taking eight days or more to cross in a steamship, and to fly across seems too much to ask of their credulity.

But this is the same lack of belief in the aeroplane which forced the Wright brothers to go to Europe to find recognition of their invention, and which to-day, after three and one-half years of war finds the United States

(*Continued on page* 44)

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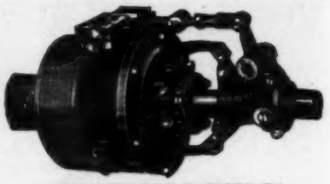

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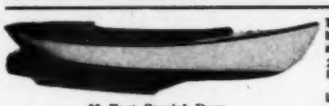

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State of New York, County of New York, ss. Before me, a Notary Public in and for the State and county aforesaid, personally appeared E. C. Wright, who, having been duly sworn according to law, deposes and says that he is the Business Manager of MoToR BoatinG and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, to wit:

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(Signed) E. C. WRIGHT
Business Manager.

Sworn to and subscribed before me this 25th day of March, 1918. S. B. Flaum, Notary Public, New York County. (My commission expires March 30th, 1918.) (Seal.)

FROM the day they started, the makers of the Sonora have devoted all their energies to producing The Highest Class Talking Machine in the World.

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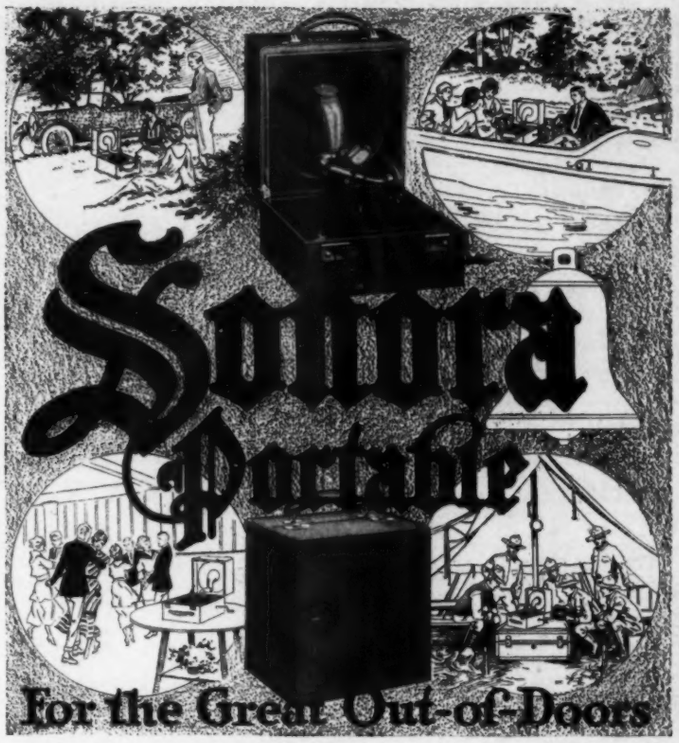

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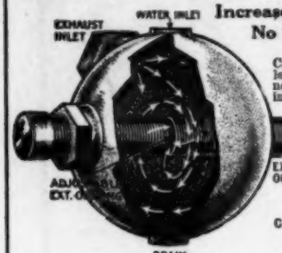

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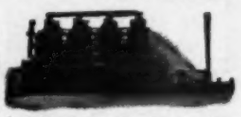

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Anything in the boat line from K. D. to complete outfits.

RICHARDSON BOAT CO., North Tonawanda, N. Y.

Motor Boat Heroes

(*Continued from page 8*)

commands or in handling the steering oar, and the craft may be swept far enough around to one side or the other for the next breaking wave to catch it under the fore quarter or, worse still, full broadside. In either case a capsize is likely to follow.

Sometimes when a launching is undertaken in extremely rough weather the boatmen are upset repeatedly before they succeed in getting on their way to sea. And sometimes even the best of surfmanhsip must yield impotently before the might of Old Neptune.

Once the boat gets beyond the inshore breakers success rests largely with the captain. This officer stands in the stern where he can command a full view of the sea, oarsmen and boat, as he works the blade of his long steering oar from side to side with the full weight of his body behind it. He must know when to order his men to speed up, slow down, rest on the oars or back water, so as to avoid the waves when they are the most dangerous. This moment comes when the over-balanced wall of swiftly-moving water crashes forward into the depths and becomes a boiling, frothing, devil's brew of destruction. To be caught in the break spells certain disaster to the inexperienced, while to the veteran surfman it means a thorough drenching if not a capsize. Safety and success at such a moment are entirely a matter of teamwork between steersman and oarsmen.

The same tactics in boatmanship hold good in the work of getting to land, with the added requirement that the boat captain must now keep a wary eye both ahead and behind. To be caught by a breaker under the stern while running shoreward is fraught with even greater peril than to be struck similarly under the bow, since if a capsize ensues in the first instance, the oarsmen are likely to be thrown into the water backward, while the steersman may be hurled many feet away from the boat.

A notable instance of this kind is recalled in which the boat, flung end over end from the crest of a monster wave, catapulted the captain 40 feet through the air. Superior surfmanship, however, saved both oarsmen and officer. The former regained the boat—a self-righting and self-baling craft—and escaped to less dangerous waters, and the latter kept afloat in the surf until swept by an inshore current within wading distance of the land.

Uncle Sam Contracts for Concrete Ships

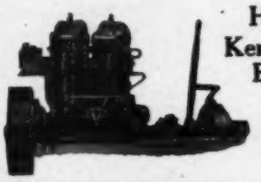
(*Continued from page 27*)

concrete, supporting deck beams which frame at the side into main frames. Two hatchways are furnished. The hatch coamings are longitudinal beams framing at their ends into main deck beams and carrying the deck alongside the hatchway on beams which are partly cantilevered from the side frames and partly flexual beams across the hatchway coaming. A double bottom is provided by precast concrete plates spanning the tops of the keel frames and tightly joined over these frames. On top of this interior plating 2- by 4-inch timbers are laid over each frame and on them are spiked the 2½-inch floor timbers of the hull.

A special reinforcing of longitudinal and cross beams is provided for the engine bed. The engine exhaust is through the main mast which is hollow. The cabin is of wood. Wooden fenders are provided along the hull and a wood stem is bolted at the bow. The rudder and its fittings are of iron.

In the picture of the shipyard is also shown the floating dry dock which has recently been completed by the company, the first concrete dry dock ever built. This is of the usual type of floating dry dock design, with poured and plastered side and poured frames. It is being used by a company building pleasure craft and will float a ship up to about 100 tons.

The Fougner company has also recently built a 50-foot concrete tug, which is used as a pleasure cruiser by officials of the company. This craft is also powered with a heavy-duty Bolinder oil engine and will make 9½ m.p.h.



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The Boat You Build

DEFOE BOAT & MOTOR WORKS, 3218 State St., Bay City, Mich.

Develop Inland Waterways

(Continued from page 32)

represent geographical divisions, such as the North Atlantic, Gulf or Pacific Seaboard, the Great Lakes, the Ohio or Mississippi Valley, etc., and covering the whole of the country except the arid and mountainous regions of the West. All of these officers are elected by the delegates present at the annual conventions, and their term of office lasts only from one convention to the next, although all are eligible to re-election.

Speaker Clark once said that Providence has given the United States the finest lot of natural waterways to be found anywhere on earth, and we have been more remiss in improving and using them than any other nation which claims to be civilized. According to the latest calculations of the Board of Engineers for Rivers and Harbors, we have, in addition to our lake and ocean harbors, 28,000 miles of navigable waterways. Some work was being done on these all the time, but the men who made up the National Rivers and Harbors Congress felt that the work was going nowhere near fast enough, so one of the first things which they advocated was the expenditure of $50,000,000 annually until the work should be finished.

A few small appropriations for river and harbor work had previously been included in bills for the Navy, for Lighthouses or Fortifications, but so far as the record shows the first bill ever passed by the Congress of the United States exclusively for waterways was on April 6, 1802, when $30,000 was appropriated for repairing and erecting public piers in the Delaware River. One million dollars was appropriated on May 24, 1828, to aid in the construction of canals, and in 1837 and 1838 appropriations were made of about $1,500,000. In 1852 a bill was passed carrying $2,099,000, but only small amounts were appropriated from that time until after the close of the Civil War. The amounts were gradually increased until for the ten years ending with 1895 the appropriations averaged $12,201,000 annually.

The active work of the National Rivers and Harbors Congress began in 1906, and the workers were greatly encouraged when a bill was passed in 1907 carrying a total of direct appropriations and contract authorizations of $87,062,432. A better indication of the results achieved in this direction, however, is given by a comparison covering a series of years, and the average annual appropriation during the ten years before the work of the organization was begun was $21,395,025, while in the ten years during which that work has been going forward the average annual appropriation has been $36,212,431.

The appropriations were not only too small but they came to far apart. From 1866 to 1882 appropriations, although small, were made every year with the exception of 1877. From 1882 to 1896 bills were passed every two years, and then for a number of years they were passed at intervals of three years, so along with the demand for larger appropriations came the demand that appropriations for rivers and harbors should be made every year, just as is done for the Army, the Navy or any other regular object of governmental expenditure. The average of $50,000,000 a year has not yet been attained, but in 1910 the passage of annual river and harbor bills was begun.

In presenting the bill of that year, Chairman Alexander, of the Rivers and Harbors Committee, stated on the floor of the House that "the work done by the National Rivers and Harbors Congress has so developed public sentiment that the committee feels justified in stating that hereafter rivers and harbors bills will be presented annually."

Thus, among the results achieved have been a large increase in the average annual appropriation for waterways and the placing of waterways appropriations on an annual basis. If your readers survive this preliminary statement, another article will tell of some other things that have been accomplished, and there will be a dissertation on the subject of "Pork."

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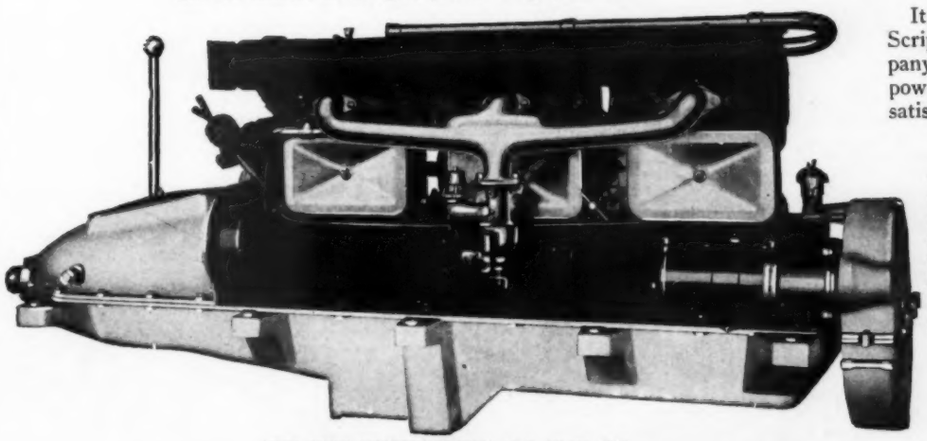

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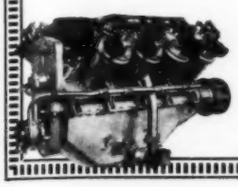

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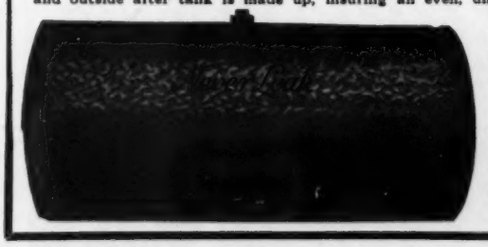

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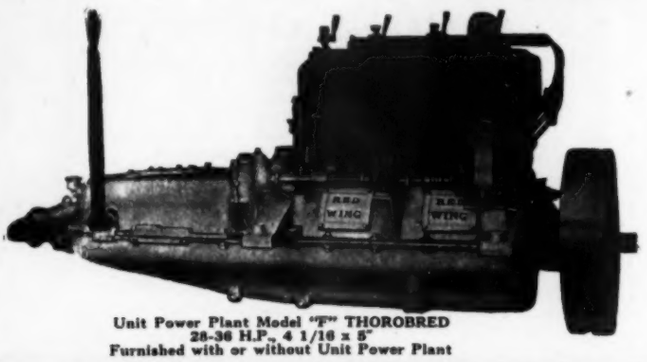

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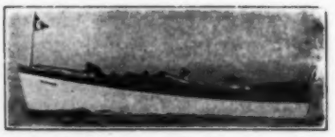

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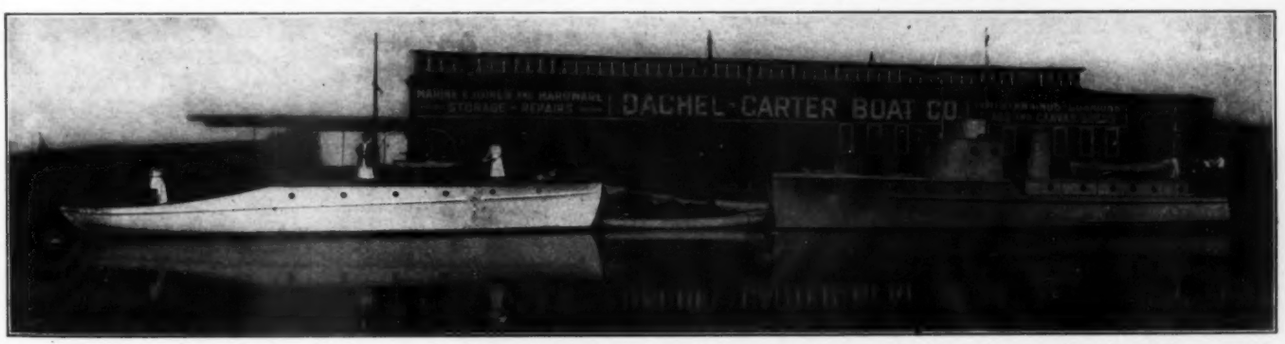

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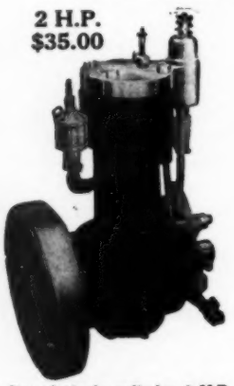

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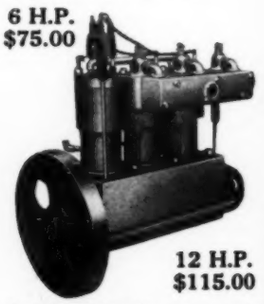

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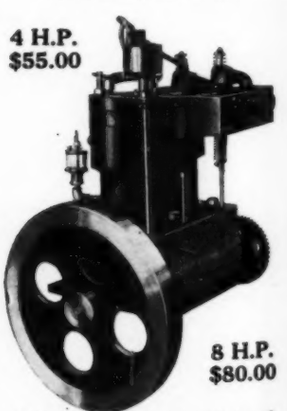

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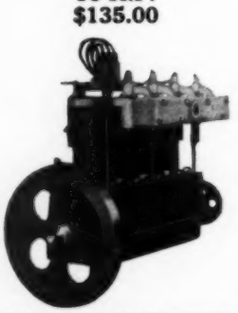

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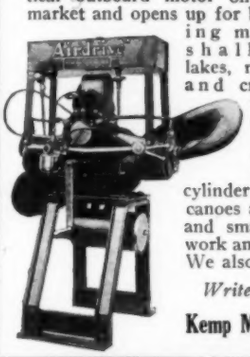

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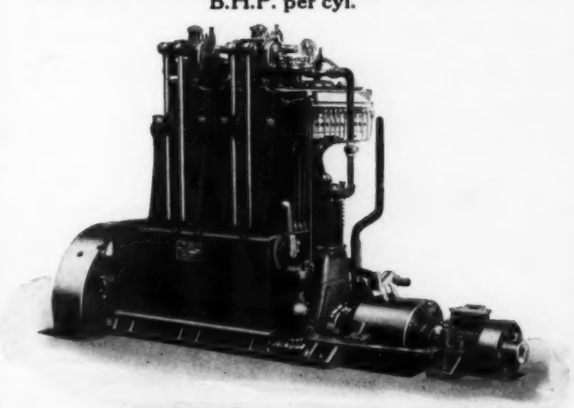

View showing a 2-cylinder, 20 B.H.P. Hvid Oil Engine as built by the Burnell Engine Company, South Bend, Ind.

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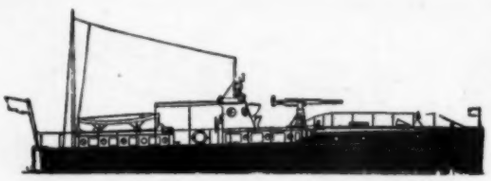

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Figure 1404

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Quartered Oak Case, Each...$42.50
Mahogany Case, Each..... 44.00

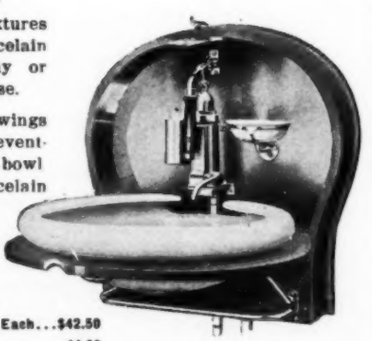


Fig. 1302

THE J. H. CURTISS CO. 2 South Street, New York

THE GREAT 2-CYLINDER

KOBAN

ROWBOAT MOTOR

The KOBAN is the outboard motor for those who demand real service and freedom from motor troubles.

In every detail of design and construction it is the product of the highest engineering and manufacturing skill.

It has surprising speed, due to the extra power delivered from its two cylinders. The Koban special tilting device makes a hit with fishermen and hunters.

The **Koban** does not shake the boat. The cylinders fire at the same time, neutralizing the shock. Only by this 2-cylinder opposed construction can you avoid the vibration that makes riding disagreeable, opens seams and ruins rowboats.

The light weight of the **Koban**, its two cylinder design, its simplicity — make it the best rowboat motor on the market. The **Koban** delivers maximum power from every gallon of gasoline.

"Towed in 26-ft. launch with twelve passengers and trailer carrying four men." — Grand Rapids, Mich.

The **Koban** is unexcelled for commercial uses because of its power, speed, reliability and trouble-proof features. It is used by the U. S. Government and in 36 foreign countries.

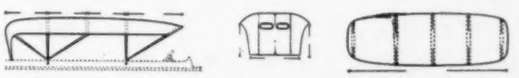
The **Koban** proved its dependability by making an 800-mile sea voyage from Seattle to Ketchikan, Alaska, driving a 16-ft. rowboat with two men and loaded with supplies.

Write for illustrated catalog. Dealers and local agents wanted. Write for full particulars.

Koban Manufacturing Co.
246 South Water St.
Milwaukee, Wis., U. S. A.

Save ½ to ⅔ by Re-covering Your Own Top

If your boat top frame is in good condition, we can save you half the cost of a new top with our proven system enabling you to recover your own top.



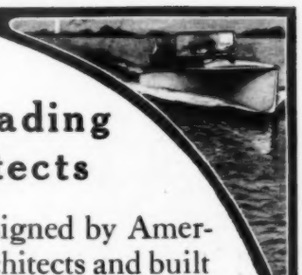
"Casco" System Measuring Charts

Makes it very simple for you to cover any boat top, insuring a perfect, tailored fit. We absolutely guarantee your satisfaction.

Our catalogue contains the charts—also complete line of sample fabrics; the best and most durable special top materials made. Request a copy and investigate this satisfactory system for saving expense.

The Cincinnati Auto Specialty Co.
Boat Dept. 4th and Elm Sts. Cincinnati, Ohio

Designed by America's Leading Naval Architects



Mullins boats are designed by America's leading naval architects and built in the world's largest boat factory. Built by an organization of long experience—"Builders of Better Boats for 21 Years."

MULLINS STEEL BOATS CAN'T SINK

Never leak, water-log, dry out, warp or open at the seams—give 100% service.

Mullins rowboats, power boats and canoes are well known everywhere—over 68,000 in use.

THE W. H. MULLINS CO.
81 Franklin St., Salem, Ohio

World's largest manufacturers of steel and wooden pleasure boats.

Something Different-Something Better $48.00
Liberty Drive Row Boat Motor

THE new motor for propelling rowboats. Attaches to any rowboat in one minute—by just turning up two thumb screws. Fuel tank quickly detaches for convenience in filling and for safety from thieves.

4 New Exclusive Advantages

Direct drive from crank shaft to propeller; power—speed. Drives the boat anywhere it will float, over shallows, sunken logs, rocks. Goes thru weeds like an eel. Propeller shaft lowered and raised by pressure on steering handle, automatically lifts when propeller strikes an obstruction.

Liberty Drive is the only genuine tilting motor—you can drive your boat right upon the beach—no dock necessary.

You can turn your boat in its own length, that's quick maneuvering.

Backed by the Caille Guarantee

Price fits any purse—simple design—simple to use. Drives an ordinary rowboat three to ten miles per hour. A POSTAL BRINGS YOU THE CATALOG.

For Pleasure Fishing Hunting Business

The Caille Perfection Motor Company
1045 Caille Bldg.
Detroit, Mich.
U. S. A.

Two Kinds o' Service

A service of smooth-running efficiency—the utmost in power—the minimum of upkeep costs,

Or,

A service broken up with repairs, engine overhauling, delays and costly periods of inactivity.

The difference in cost between the two is a few dollars — the slight additional cost for Bosch Magneto Ignition.

BOSCH MAGNETO COMPANY
Main Offices: 231 West 46th St., New York
Branches: Chicago, Detroit, San Francisco
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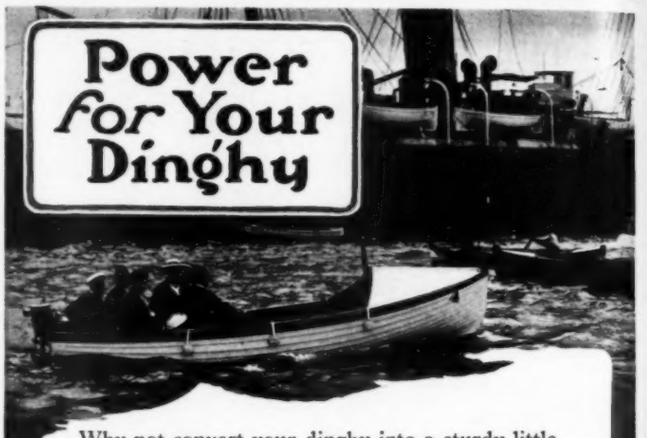
MORE THAN 3,000,000 BOSCH MAGNETOS IN USE



Power for Your Dinghy

Why not convert your dinghy into a sturdy little power boat and make it more useful?

For fishing and making those many little side trips, what you need is an

EVINRUDE
DETACHABLE ROWBOAT & CANOE MOTOR

It furnishes a surprising amount of power for its size and the cost of running it is very little.

Special method of balancing gives the 1918 Evinrude wonderfully smooth, vibrationless running. Equipped with Evinrude magneto—Built-In Flywheel Type—and Automatic Reverse.

New catalog ready—write for it.

EVINRUDE MOTOR CO.
832 Evinrude Block **Milwaukee, Wisconsin**

Over 90,000 sold—used by 25 Governments

DISTRIBUTORS:
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Several extremely interesting express cruisers, runabouts, and yacht tenders are included in boats available for spring delivery. See them at our shops.

Speedway **GASOLINE ENGINES**

Gas Engine & Power Company and Charles L. Seabury & Co.

Morris Heights Consolidated **New York City**

Miller

A Common-Sense Motor at a Common-Sense Price

Before you buy a marine motor of any size or type let us tell you about the Miller model best suited to your purpose. Let us explain Miller design and construction, Miller economy and low prices, and Miller service and satisfaction.

Miller Motors are giving extreme satisfaction in every kind of service, the world over. They embody every essential feature for maximum efficiency and reliability. They offer the greatest value for your money because we have adhered to standard construction without wasting money on experimental designs.

Fourteen models, all four-cycle. Medium and heavy duty types. 4 to 65 H.P.

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AGENTS:
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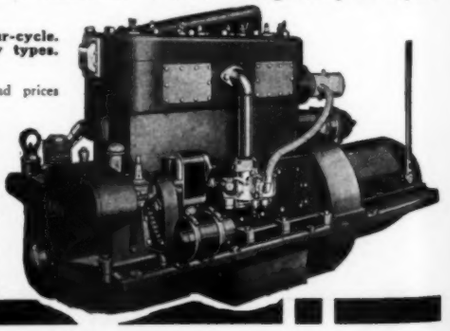

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For All Purposes

We have been making drop-forged Wrenches for nearly half a century and now carry in stock about 1000 sizes of 40 patterns: —among these are the following:

Box, Hexagon and Square	Check Nut (Thin)	Machine "S"	Structural
Cap Screw, Hex. and Square	Construction Engineers'	Set Screw	Taper Handle
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Carriage Makers'	Heavy for Cap Screws and Square Nuts	Spanner	Tool Post
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When ordering specify "Williams' Wrenches" and get the best.

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"The Wrench People"

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KEY MODEL

Wrench

First aid in construction

Made in 28"—36"—48"—72"

COES WRENCH COMPANY

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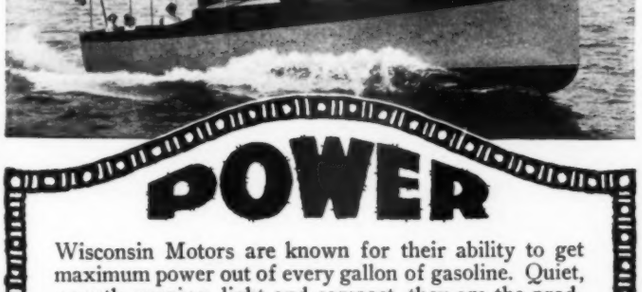
OR YOUR JOBBER



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Wisconsin Motors are known for their ability to get maximum power out of every gallon of gasoline. Quiet, smooth running, light and compact, they are the product of the highest type of engineering skill.

Wisconsin Motors

CONSISTENT

for marine use contain those same qualities that have made Wisconsin Racing Motors champions of the world on road and speedway. If it's a Wisconsin it's a consistently dependable motor.

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Station A, Dept. 302 **Milwaukee, Wis.**

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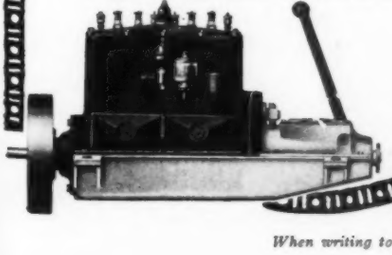
Pacific Coast Distributors: 1310 So. Los Angeles St., Lost Angeles, Cal.



Four, six and eight cylinder types. Write for specifications.

"NORMA" BALL BEARINGS

(Patented)

Quality—a thing sought after by every boat and engine builder—a thing intangible, almost indefinable, but the most desirable element in a boat or engine. One thing, however, is sure—quality must be consistently uniform throughout every part, every accessory, and every part of every accessory. There can be no minor flaws in the perfect jewel of high quality.

"NORMA" High-Quality Bearings are the standard bearings in those high-quality magnetos and lighting generators which are found so consistently good as to be the standards on high-quality boats and engines. "NORMA" Quality explains.

Be SURE. See that your Electrical Accessories are "NORMA" Equipped.

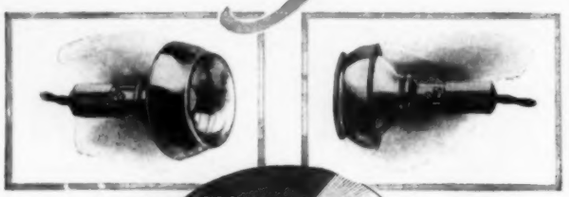
"NORMA"

THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

BALL, ROLLER, THRUST AND COMBINATION BEARINGS

$5.00



$5.00 Postage Prepared, completely equipt and ready to attach to car

Try it 10 days. If you don't like it, send it back and get your money

A Handful of Portable Illumination

The Cell-Beam Concealed Searchlight is a portable lamp, not a stationary searchlight, yet it throws more actual light than the ordinary searchlight. It throws a concentrated beam of light 500 feet and also supplies a general diffused illumination in the immediate vicinity. It weighs less than a pound, measures 5½" over all, is beautifully nickel-plated. Attaches with a clip to any convenient place around the boat. Not only a highly efficient Spot and Searchlight, but the most efficient trouble and inspection light yet developed. The first really handy searchlight designed for the Motor Boat Owner. Order one TO-DAY, try it, if you don't like it, send it back and we will refund your money.

THE CELL-BEAM CORPORATION
501 Fifth Avenue New York City

"Sands" Marine Sanitary Fixtures

Two popular closets for small boats at prices within reach of all—install one NOW in YOUR boat.

"BOW" CLOSET—PLATE S-2050
(Design Patent Applied For)

The "Bow" Closet, vitro-adamant bowl, 2½" pump, located at rear, fitted with swing handle. Quick opening supply valve. Space occupied, 18x24".

Pump rough with finished trimmings, oak seat, N. P. hinges..... $30.00

Dimensions: front to back 23 in., width 14 in., height 12 in. Net weight, 35 lbs. Shipping, 70 lbs.

PLATE S-126

The "Gismora" Composition flat way sea cock.

	Price
¾ inch	$2.25
1 "	3.00
1½ "	5.25
2 "	8.00

Sizes 2½" and 3" also made.

PLATE S-2062

Angle Pattern Sea Valves, sizes ¾" and 1½".

Price, per pair $6.00

"WINNER"—PLATE S-2061
(Patented—Copyrighted)

The "Winner" Pump Water Closet. Vitro-Adamant Round Hopper Bowl, oak seat, N. P. brass hinges, 2½" supply and waste pump. "Sands" Special quick opening supply valve.

Plate S-2060 Fixture as described with oak seat..... $24.00 net

Plate S-2061 Fixture as shown with oak seat and cover..... $25.00

PLATE S-3190

The "Mono 12" Vitro-Adamant Corner Lavatory with N. P. Brass Pump and waste fittings and N. P. Full "S" Trap $25.50

New Style Double-Acting Brass Bilge Pump, with foot attachment and 5 ft. discharge and suction hose with brass strainer.

No. 1—1½" diam., 15" long... $5.00
No. 2—1½" diam., 15" long... 6.50
No. 3—2" diam., 24" long... 14.00

Owing to the abnormal high prices and scarcity of material and labor, selling prices necessarily are advanced to meet conditions, ranging from list prices as net up to 50% advance over list based upon cost.

PLATE S-750-A

PLATE S-750 similar to above except without foot rest and with single hose. Prices on request.

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1849 *"Sixty-nine Years of Quality"* 1918
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AMERICA'S SMARTEST MOTOR

Universal 9-12 H.P. 4 CYLINDER 4 CYCLE

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The "Automatic"

Automatic operating cost is low, the engine is not wasteful of fuel and oil. Whether you use gasoline, kerosene or producer gas the results are the same—efficient service.

Automatic upkeep expense is almost negligible. The engine has bronze bearings throughout, it has an enclosed oiling system that is dependable, the speed is controlled by an enclosed governor. Every working part is easy of access.

Automatic engines are built in two models—cruiser and work boat. Let us send you full particulars of the type you require.

The Automatic Machine Co.
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ELECTRIC SEARCHLIGHT MAKES NIGHT BOATING SAFE AS DAY

No matter what size boat you have, there is a Delta Electric Lamp for it. For large power boats—the Delta Electric Searchlight is the thing. Throws a thousand-foot beam. Focus is adjustable. The light can be spread out to illuminate a wide space in front of the boat. Two-point suspension permits directing the light up, down, front, back and to the sides. It is powerful, practical and flexible. For medium sized power boats—the No. 5 Boat Light. Costs little to operate, runs on two dry cells. Handy and convenient. Can be instantly detached from the pedestal and taken ashore for general utility lighting uses.

For small boats, canoes and the like Delta Lamps are just right. Throw a 300-foot beam and are economically operated on two dry cells.

PRICES:

Delta Searchlight $12.00. Delta No. 5 Boat Light $3.50

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DELTA ELECTRIC CO., Dept. 52 **Marion, Indiana**

Manufacturers of the World's Standard Battery Lamps for Autos, Boats, Buggies, Bicycles and Hand Use.

Safety Absolute

Human life is priceless. Human safety is too vital to permit taking any chances. Every man, woman and child who goes on the water, whether in a motor boat, yacht, or in a liner crossing the submarine zone, should be provided with the

International's

EVER-WARM SAFETY SUIT

THE REAL LIFE PRESERVER

This Safety-Suit, the greatest life saving invention of the age, is protecting soldiers, sailors, nurses and doctors on their way to the front. It has already saved many lives in submarine disasters. Its value has been proved in every possible way—hundreds of times.

You cannot drown or chill with this suit on, whether conscious or unconscious and no matter how long in the water. It is a human boat and a human thermos bottle. Won't sink if torn or cut because it doesn't depend on air for buoyancy.

Write today for prices—for your boat, or for your soldier friend

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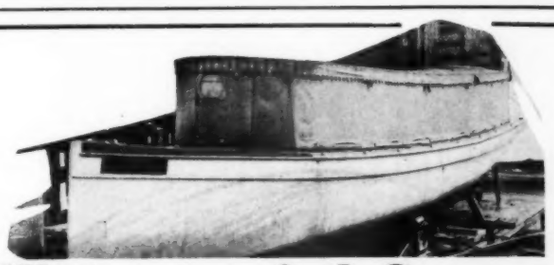

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The first saving lies in the positive protection of cargoes, material and equipment. Besides, if the canvas is treated with a waterproofing that also *preserves* the fabric there is a big saving in canvas cost.

Preservo—the scientific canvas waterproofing—is exactly what its name implies, *a true preservative*. Canvas treated with Preservo will wear twice as long as untreated canvas. Preservoed canvas keeps soft and pliable—is proof against mildew and decay and remains *permanently water-tight*.

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Insist on Preservoed canvas and protect your canvas investment. Sample of Preservoed canvas sent free—on request.

Preservo Trade Mark Registered **Waterproofs and Preserves Canvas**

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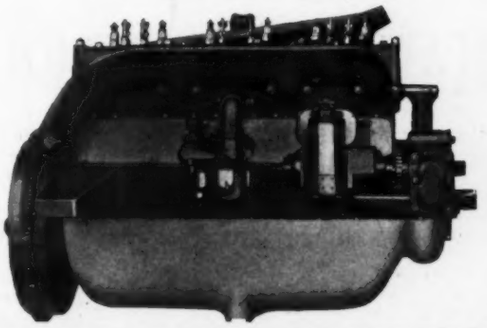
Genuine 6-cylinder "Continental" motors, size 3½ x 5¼, equipped with Bosch magneto, Schebler carburetor and Auto-Lite generator. Absolutely new and unused—

ALL FOR $148

Less Than One-Third Cost



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Send today for descriptive circular, blue prints and ful engineering data. Immediate shipment guaranteed. Address

Standard Motor Parts Company

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FOUR CYCLE MARINE MOTORS
Built up to a Standard—not down to a price

A Clean-Cut Power Plant
for Commercial Boats and Cruisers
Model D-4, Medium Heavy Duty
36 Horse Power Bore, 4½ inches Stroke, 8 inches

Quality construction throughout—in design, materials, workmanship, finish and equipment. Exceedingly compact for its power and exceedingly sturdy for its size.

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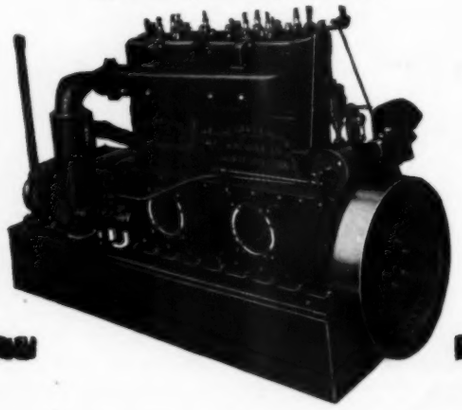

Seaworthy!-
and speed when you want it

Beauty — convenience — speed if you want it—ease of control —and above all seaworthiness, mark

RacineWis Runabouts Everywhere

The utmost in Service—that's why RacineWis boats have been chosen by U. S. and Foreign Gov'ts, mercantile firms and prominent yachtmen the world over.

Runabout, Speed Boat, Cruiser, Freighter, Rowboat or Canoe—there is a RacineWis model to fit your needs —or we will design and build one especially for you.

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Getting the Most
out of Your Engine

You can't expect to get the full quota of power, service and durability out of your engine unless you supply it with a lubricating system which cannot fail under any condition. Remember that a marine engine operates under full load all the time, and that even a momentary failure of lubrication means metal to metal contact of wearing parts which will result in scored cylinders and burned out bearings.

MANZEL FORCE FEED OILERS

pump the oil *under pressure* to each wearing point individually. Nothing is left to chance. As long as you can see oil in the sight glass you know that each part is being properly supplied.

Manzel Oilers not only make complete failure of lubrication impossible but by their uniform measured operation they use the minimum of oil and reduce engine wear to the lowest possible degree.

Made in a complete variety of sizes and styles, from one to fifty feeds. Rotary or Ratchet Drive.

Write today for copy of our free booklet on lubrication.

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The WRIGHT Engine for Your Boat

KEROSENE

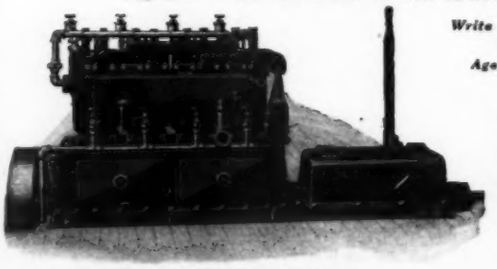
The ultimate solution of the fuel problem. Saves *more than half* of fuel expense, without sacrificing flexibility, power or reliability.

The Wright Kerosene Engine is thoroughly perfected. The kerosene is perfectly *gasified* before it enters the cylinders. It burns clean, free from carbon or lubricating troubles. No smoke or odor in exhaust.

Valves in cylinder heads. Make and break ignition. Bosch Low Tension Magneto

3-Cyl.	6 x 7½"	22-30 H. P.
3-Cyl.	7½ x 9 "	35-45 H. P.
4-Cyl.	6 x 7½"	30-40 H. P.
4-Cyl.	7½ x 9 "	45-60 H. P.
6-Cyl.	6 x 7½"	45-65 H. P.
6-Cyl.	7½ x 9 "	70-90 H. P.

6 x 7½" runs from 400 to 550 R. P. M.
7½ x 9 " runs from 350 to 475 R. P. M.



Four Cylinder Kerosene Engine

Write to-day for full details.
Agents Wanted.

WRIGHT MACHINE COMPANY
Owensboro, Ky.

Profitable Shipyard and Garage

DUE to call for Military Service, I offer for immediate sale the Garage Bout de L'Ile comprising an automobile garage and shipyard with complete facilities for repairing, excellent shore with plenty of water, marine railways and storage for 100 boats. It is the best location on the island of Montreal for a shipyard. The equipment is complete and the business well established.

This is a real opportunity for the right parties. Full investigation is invited.

Write today for details.

Wilfrid Coté, Proprietor
Garage Bout de L'Ile
Bout de L'Ile,
Prés Montreal, Canada

Your Motor-
"LUNKENHEIMER Equipped"

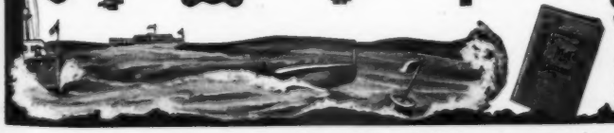
signifies service, reliability and permanence.

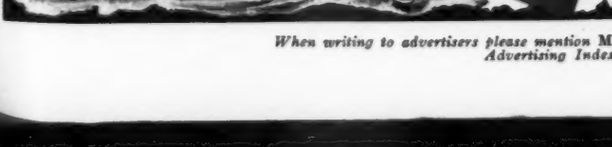
Lunkenheimer Motor Accessories possess qualities of exceptional merit, have demonstrated their reliability on all types of internal combustion engines and are in use everywhere.

Your motor should be "Lunkenheimer-Equipped."

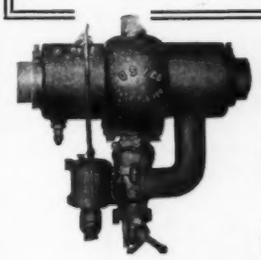
Write for Motor Accessories Catalog No. 4-CC, which illustrates the complete line.

THE LUNKENHEIMER CO.
"QUALITY"
Largest Manufacturers of High Grade Engineering Specialties in the World
CINCINNATI
New York Chicago Boston London





Saved $3500 In One Year in Fuel Costs



The Olsen Vaporizer did that last year for the Schooner Gertrude De Costa of Boston. It made possible the substitution of kerosene for gasoline as fuel.

The Olsen burns clear kerosene and burns every drop. If you expect to install a new motor this spring insist that the manufacturer supply your motor with an Olsen. If you plan to use your old motor you can easily transform it into a kerosene burner by attaching an Olsen yourself. Several large marine motor makers have already adopted the Olsen as standard equipment.

The Olsen Gives Your Motor

Increased flexibility. The same power as gasoline. A saving of from 30 to 40 cents on every dollar's worth of fuel
And absolute freedom from carbon

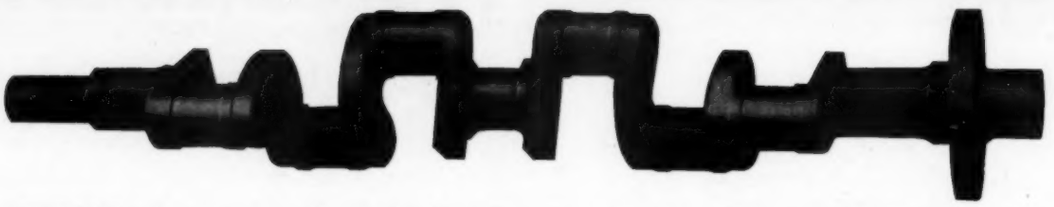
FULL COST REFUNDED IN 30 DAYS ON REQUEST

Read what the Olsen did in the Grenfell Trip to Labrador. Our booklet gives this and other interesting experiences. May we send you one?

U S V C O

U. S. VAPORIZER CO.
214 STATE STREET BOSTON, MASS.

WYMAN-GORDON



THE advantages of employing Wyman-Gordon Guaranteed Forgings in the construction of marine, aviation and automobile engines are now realized by the leading manufacturers in these industries.

They are quality forgings, produced by forgings experts, working with a degree of knowledge and experience in this work which is not equalled by any other organization.

WYMAN-GORDON COMPANY

WORCESTER, MASS. CLEVELAND, OHIO

GUARANTEED FORGINGS

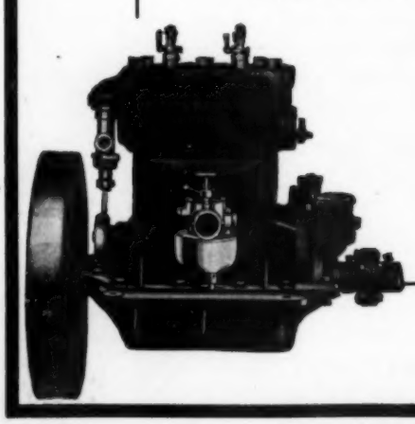
THE NEW ROBERTS
FOUR CYCLE

2 CYLINDER 5-8 HORSE POWER

If you have a runabout, tender or fishing boat up to 25 feet, here is the motor that will give you more genuine satisfaction per dollar than anything else on the market. It is a smooth running four cycle engine with first class materials throughout, and is built to meet a definite demand for a high grade motor of this small size.

Price $110 with Full Engine Equipment.

The price of this engine speaks for itself. And it bears the same Roberts quality that has always distinguished Roberts power plants in the Marine and Aeronautic fields.



Bore 3¾". Stroke 4". Weight 178 lbs. Burns gasoline, distillate or kerosene. Intake manifold is cast integral with cylinders and exhaust manifold, providing plenty of heat for the economical use of fuel. Drop forged steel connecting rods, crank shaft, cam shaft and main bearing caps. Nickel babbitt main and connecting rod bearings, bronze plunger pump, copper asbestos gaskets and bronze piston pin bearings. Equipment includes ball thrust bearing, carburetor, spark plugs, priming cups, drain cocks, starting crank and flange coupling.

Write today for full details. We make many other sizes of Roberts motors for marine, agricultural and aeronautic service

THE ROBERTS MOTOR MANUFACTURING COMPANY

1200 ROBERTS BLDG. SANDUSKY, OHIO

LUMA Radium Luminous Compound

For Compass Cards, Watches, Clocks, and Marine and Aeronautic Instruments

Luma contains genuine radium.

It is the brightest and most dependable luminous material in the world.

Think of the advantages of a watch or compass that you can read on the darkest night without artificial light.

Luma is now used with complete success on the dials of aircraft, marine, and automobile instruments, watches, clocks, etc. Its permanency and superior luminosity meet the requirements of the British Admiralty and specifications of the United States Government.

Made in several grades or degrees of luminescence, each grade containing the exact amount of Radium necessary to assure the best results.

Literature and full information upon request.

Radium Chemical Company

Forbes & Meyran Aves., Pittsburgh, Pa. Astor Trust Bldg., New York

HACKER -- CRAFT -- RUNABOUTS

Serve you on the water, as the Auto does on land

"STROLLER" makes fastest time at Miami. Averaging 32.31 miles, exceeding her original guaranteed speed by 10%. Stroller is on her sixth season, and is still a boat. It demonstrates that HACKER-CRAFT are built for service, and attain their guaranteed speed.

"STROLLER" was built by Mr. Hacker in Detroit, before he had any connection with any individual or Company, and delivered from Detroit direct to her owner.

HACKER CRAFT are designed and built under the personal supervision of John L. Hacker, designer of most of America's fast boats, and built by his own Company. They represent his latest work, and have back of them his 20 years of practical experience. They are the utmost in Swift-Luxurious Water Craft.

"FIRENZE-II" Actual Speed 32.2 Miles.

"SEA-PUP-II" Actual Speed 32.7 Miles

MOST EFFICIENT 32-FOOTERS EVER PRODUCED.
Guaranteed speed 30 miles with Four Cyl.-100-Sterling

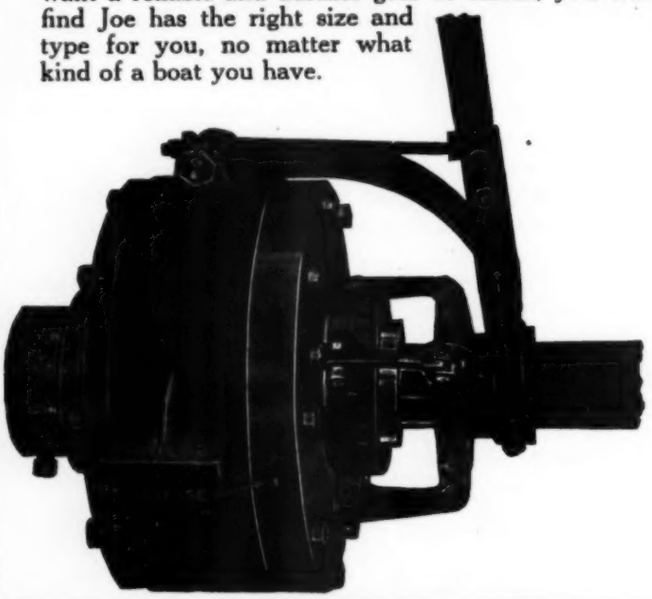
HACKER 26-FOOT SPECIALS

A few of these are still available. They are an absolute high-class proposition. Powered with Wisconsin Motors. Speeds from 23 to 25 miles, and delivered to you as complete as an Auto of the higher class. Positively the best outfit of its size to be had. You had better write for particulars today.

323 CRANE AVENUE **JOHN L. HACKER BOAT CO.** DETROIT, MICH.

JOES Reverse Gear

You'll find Joes Gears on heavy commercial boats, on big motor yachts and cruisers, on hydroplanes, fast runabouts and pleasure boats of medium size. If you want a reliable and durable gear or clutch, you will find Joe has the right size and type for you, no matter what kind of a boat you have.



The Chomly, 75 ft. x 18 ft. x 8 ft. Diesel Motor with No. 172 Joes Duplex Drive Gear. The engineer took the gear apart after a very long run, then put down in his log, "Some Clutch."

JOES DUPLEX DRIVE HEAVY DUTY REVERSE GEARS
For Heavy Boats and Racing Craft.
JOES FAMOUS HIGH POWER GEARS
For High and Medium Speed.
JOES HIGH SPEED ONE-WAY CLUTCHES
Especially for Hydroplanes and High Speed Propositions; Smallest Size Transmits 30 H.P. at 1,000 R.P.M.
JOES SAFETY REAR STARTERS
Best Made. Absolutely "Kick-proof."

Write today for latest catalog. It contains valuable information you should have before you select any gear, clutch or starter. It is free.

The Snow & Petrelli Mfg. Co.
154 Brewery St., New Haven, Conn.

AGENTS: J. King & Co., 10 Church Row, Limehouse E. London, Eng.; L. H. Coolidge Company, Seattle, Wash.; Wood Vallance & Leggatt, Vancouver, B. C.; A. R. Williams Machinery Co., Toronto, Canada; W. E. Gochenaur, 631 Arch St., Philadelphia, Pa.; Pyke Motor & Yacht Co., Montreal, P. Q., Canada; Sutter Brothers, 30 Church St., New York, N. Y. Service Station, Foot of 92d Street, Brooklyn, N. Y.

FINISHED CRANK SHAFTS

H. GILL & SONS FORGE AND MACHINE WORKS, BROOKLYN, N. Y.

We are furnishing them to some of the leading marine engine builders. Carbon and Alloy Steel, Heat Treated to your own specifications. We grind all Pins and Bearings. Forged, machined, and finished complete in our own plant. Let us quote you.

JEFFERY'S MARINE GLUE

In some places economy is all right, but when you come to Marine Glue the difference in cost between the ordinary and the best is so little that you can't afford to take the risk of having to do the job over again for the sake of saving a little on the material.

It pays to use Jeffery's in the first place, every time. Jeffery's is universally conceded to be the best and most reliable marine glue. Jeffery's Glues are specified by the best designers and used by the best builders. A little investigation will show you why.

No. 1—Extra Quality for Deck and Hull Seams of Yachts and Motor Boats. Black, white, yellow or mahogany color. Give black the preference; it is more elastic and satisfactory in every way.

No. 7—Soft Quality for Waterproofing Canvas, for Covering Decks, Tops of Cabins, Canvas Boats, Canoes and Flying Boats. Black, white or yellow. With a coat of paint once a year it will last as long as the boat.

Waterproof Liquid Glue is used for the same purposes as No. 7, Soft Quality. Ready for use and requires no heating; simply open the can and paint it on. Especially recommended in combination with linen between the diagonal planking of flying boats. Will also attach canvas, cork, felt, rubber, leather, and linoleum to iron, steel, or wood.

Special Marine Canoe Glue. Best Filler for Canvas. Black, White and Yellow. Every canoeist should carry one of our 35c emergency cans. Sent by mail on receipt of 40 cents in stamps. Canada 47 cents.

FOR SHIPS' DECK USE No. 2 First Quality Ship Glue, or No. 3 Special Navy Glue
Put up in 1, 2, 3 and 5 lb. cans; also 14, 28, 56, 112 lb. boxes.

Sold by all Yacht, Boat and Canoe Supply Houses, Ship chandlery, Hardware, Paint, Oil and Sporting Goods Dealers.
Send for booklets, "Marine Glue, What to Use and How to Use it" and "How to make your Boat Leakproof."

W. L. FERDINAND & COMPANY, 152 Kneeland Street, Boston, Mass., U.S.A.

Save the Cost of Your Engine in One Season's Work
Harris Kerosene Engines Cost One Cent Per Horse Power Hour To Run

There are HARRIS engines doing actual work today even after a service of twenty years.

When the HARRIS KEROSENE engine was introduced last year, the entire production of the plant, at that time, was contracted for by one of the largest exporters in this country and there has been constant shipments going abroad ever since.

With increased capacity we are in position to accept orders for domestic delivery.

HARRIS engines have plenty of power, developed smoothly and noiselessly, and transmitted completely into propelling force. They are economical, safe and speedy. Built for long service life. If you install a HARRIS in your boat there will be no delays.

Tell us your requirements. Write for literature. State boat dimensions.

HARRIS ENGINE COMPANY

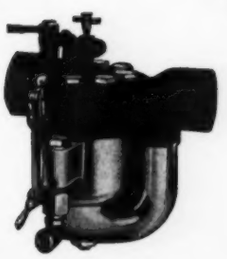
Wilmington, Del.

EXPORT OFFICE: 47 Broadway, New York, N. Y.

King of Marine Carburetors

KINGSTON

THE WORLD'S MOST POPULAR CARBURETOR



This is the carburetor that will give you the highest speed and power of which your engine and boat are capable. And it will do this on the lowest fuel consumption per hour, per horsepower.

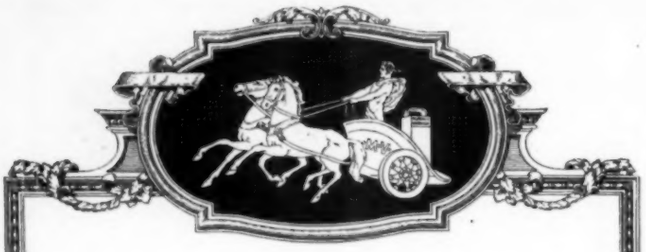
The Kingston Carburetor is scientifically designed for modern engines and modern fuel. It is making good and giving extreme satisfaction on every type of marine engine, automobile, tractor, motor cycle or other kind of gas engine. One simple adjustment covers all ranges.

It is the efficiency and popularity of the Kingston Carburetor that has made us the largest carburetor manufacturers in the world.

Write our nearest branch for details and trial offer.

Byrne-Kingston & Co., Kokomo, Indiana, U. S. A.

New York: 1733 Broadway
Chicago, Ill.: 1430 Michigan Ave.
Detroit, Mich.: 870 Woodward Ave.
Los Angeles, Cal.: 334 W. Pico St.
Boston, Mass.: 15 Jersey St.



Less Upkeep— More Economy

When your craft slides down the ways into the water it is unpleasant to think of upkeep and expense. The thing to do is to protect the beautiful hull against the elements.

Murphy Transparent Spar Varnish

"the varnish that lasts longest"

has proved its toughness and elasticity for half a century. Rough weather, salt spray and engine vibration do not crack or soften it, nor the sun make it sticky.

It costs no more than other high-grade varnish and it *does* last longest. Its use lessens upkeep and increases economy.

Our booklet, "Beautiful Boats and How to Care for Them," is free on request.

Murphy Varnish Company

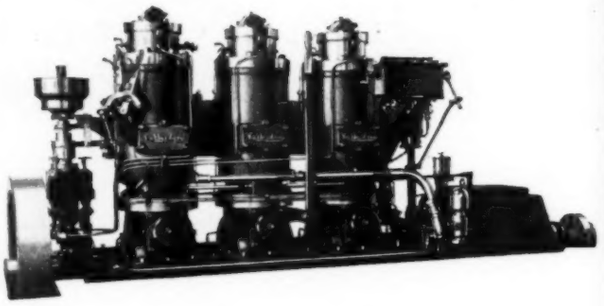
Franklin Murphy, jr., President

Newark Chicago

Dougall Varnish Company, Ltd., Montreal
Canadian Associate

ANA

Kahlenberg HEAVY DUTY CRUDE OIL ENGINES



Positive Governor Control from No Load to Full Load. Variable speed instantly obtainable from just "turning over" to wide open.

Operates on any of the crude fuel oils or kerosene.

Absolutely reliable. Fuel consumption .55 per H.P. hours.

SIZES 60 H.P. UPWARDS

KAHLENBERG standard engines in medium and heavy duty types are made in sizes from 2 to 54 H.P. and we would strongly recommend them for operating on KEROSENE, SOLAR OIL and GAS OIL. You ought to know more of the exclusive advantages the KAHLENBERG offers you.

Write for our literature stating your requirements fully.

KAHLENBERG BROS. CO., Manufacturers,

12th and Monroe Sts. Two Rivers, Wis., U. S. A.

The Right Motor for Your Boat

Going to the lake? Strap an *LA* row boat motor to your auto running board; take it in the camping kit, or as baggage.

At the lake attach it to an ordinary row boat and you have a motor boat. It's a handy motor. It's principle is two-cycle.

This LA row boat motor is perfect in principle and performance. Being of two-cycle design, without irreversible timing gears, it runs backward as well as forward.

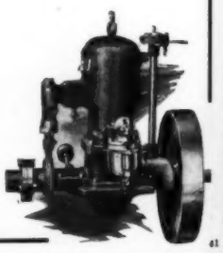
MARINE LA ENGINES
Inboard & Outboard 2 & 4 Cycle—2 to 20 H.P.

Why 2-Cycle Motors?

A single-cylinder motor becomes in power virtually a two-cylinder —economical, portable—the ideal light-duty boat engine.

For Heavy Duty

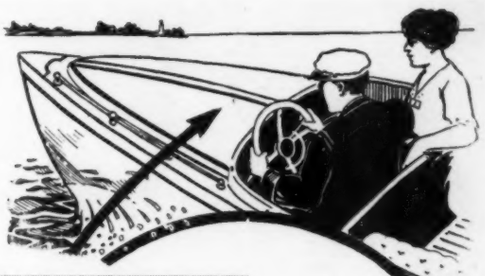
For heavy duty there is an *LA* 4-cylinder, 4-cycle engine — a rugged motor, indeed. Get the book about *LA* motors and read the 30-day trial offer.



LOCKWOOD-ASH MOTOR CO.,
1801 Horton Ave., Jackson, Mich.

Packard CABLE

Packard Jr. CABLE



75% Of Your Engine Trouble Is Due To Current Leaks From Faulty Cable.

Believe this? Well, if your spark plugs aren't working right your boat won't get very far. And to work right that spark must be continuous.

Do you know that the cables to those spark plugs carry thousands of volts? And with this high voltage, that current will jump through a tiny pin hole in the insulation?

And do you know that the vibration of your gas engine will break down the insulation of the average cable in a very short while?

These are the reasons it will be well worth your while to write Dept. M. B. for our Cable Bulletin today.

The Packard Electric Company

WARREN
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GET THE BEST, FIRST

You can buy cheap boat fittings and they *are* "cheap." Inconvenience and dissatisfaction always result—and you are soon out all you paid. Often, life as well as money is lost. The cost of everything nowadays is figured to a fine point. Lower price means lower quality.

In marine hardware QUALITY COUNTS MOST—for, sooner or later, the life of the boat and the lives in her will depend upon the strength of her fittings. WC marine fittings are produced by the

World's Largest Manufacturers of Marine Hardware--Est. 1847

71 years of success in meeting the exacting demands of the Marine Trade backs every piece sold. Here quality does not depend on chance. It is *assured* through experience and skill. At a reasonable price you buy Service—not merely so much Iron or Steel. If not at your dealer's write us.

By All Means Get This Useful Book

"Sea Craft Suggestions and Supplies"—enlarged edition—216 pages. Full of useful ideas. Tells how to box the Compass and what is proper Ground Tackle; gives hints on Steering Gear, Davits, Stuffing Boxes, Rope, etc. Full of facts that boat owners thirst to know. Sent only on receipt of 25c. You need it in your locker.

Manufacturers of the Famous Maxim Motor Boat Silencer

WILCOX, CRITTENDEN & COMPANY, INC.

Trade Mark Registered

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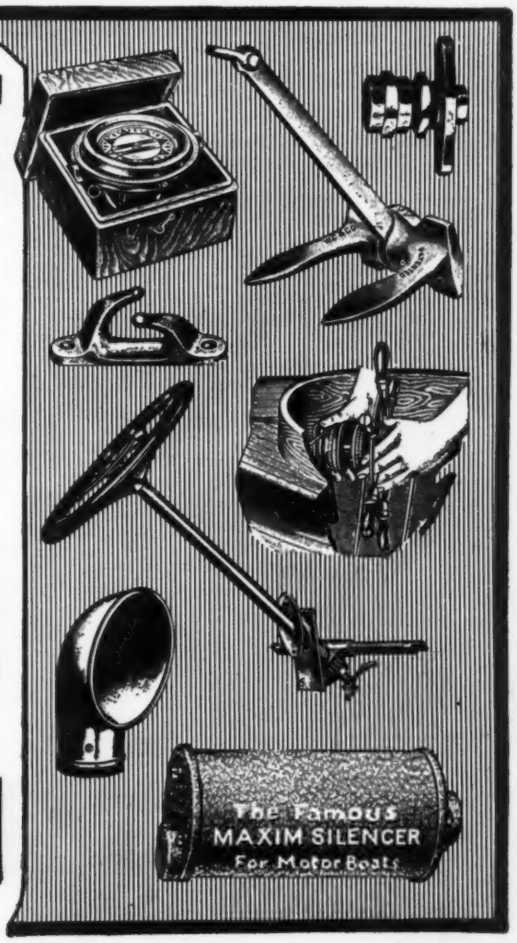

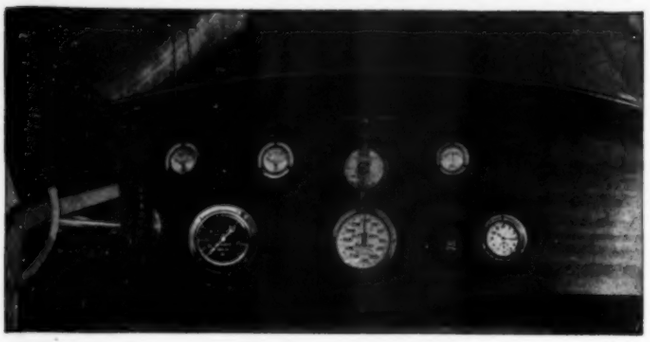

Why Not Have a Speedometer on Your Boat?

When the fog or rain blots out your observation points, how are you going to figure your dead-reckoning? Do you guess at your speed—or do you know it?

The Masters Boatmeter

tells your speed accurately at a glance. Mount it on your bulkhead and it is ever after on the job—you can refer to it anytime with less effort than looking at your watch.

There is a Masters Boatmeter for every size and style of boat. The Model C Boatmeter shown here is for fast runabouts, express cruisers, and all boats, exceeding 16 M.P.H.

For boats of less speed the Models B and F are used.

Model C indicates speed to 37 M.P.H. ..... $15 complete
Model B indicates speed to 16 M.P.H. ..... 10 complete
Model F indicates speed to 10 M.P.H. in quarter mile periods 30 complete

Some of the users of Masters Instruments are: The Albany Boat Corporation, The Belle Isle Boat & Engine Co., The Red Bank Yacht Works, John L. Hacker Boat Co., The Richardson Boat Co., The U. S. Navy and hundreds of individuals.

Install a Boatmeter on your old boat—specify it for your new one

The Masters Marine Speed Recorder shown here maintains a permanent, accurate record of the boats speed in M. P. H Made to suit boats of any speed. : Complete $15

MASTERS BOATMETERS ARE SOLD BY

IN NEW YORK

Chas D. Durkee & Co., Inc., 2 & 3 South Street
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S. L. Wadsworth & Sons, Eastport, Maine
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SEND FOR CATALOG

IRWIN W. MASTERS, Muncie, Indiana, U. S. A.

Coupon

Irwin W. Masters, Muncie, Ind.
Dear Sir: Please send me full information about Master Boatmeters and Speed Recorders.

Name.....
Address.....
City..... State.....
My dealer is.....

Practical Navigation

(*Continued from page* 58)

Dec. at 22h .... = 18° 35.5′ Eq.t. ..... = 15m 15.5s

H.D. ..... = 0.6′ H.D. 0.4s
Int. ..... 1.0′ Int. 1.0s

Corr. ..... 0.6′ Corr. 0.4s

Dec. ..... — 18° 36.1′ Eq.t. ..... + 15m 15.1s
90° 00.0′

Polar dist..... 108° 36.1′

Altitude ..... 14° 36′ 03″
Latitude ..... 38° 24′ 00″ log. sec. 10.10585
Polar distance...108° 36′ 06″ log. csc. 10.02330

Sum .....2)160° 96′ 09″

Half sum..... 80° 48′ 05″ log. cosine.. 9.20374
Altitude ..... 14° 36′ 03″

Remainder ..... 66° 12′ 02″ log. sine.... 9.96140

Log. haversine L.A.T..... 9.29429

G.A.T. 23h 16m 27s
L.A.T. 20h 29m 15s

Long. 2h 47m 12s
A. M. long.....41° 48.0′ W
Diff. long. to noon..... 1° 01.0′

Noon long.....40° 47.0′ W

Position at noon:—Lat. .....38° 51.5′ N
Long. .....40° 47.0′ W

Problem 3. Same data as problem 2, but solution is by Application of a Longitude Factor.

W.T. ..... 8h 12m 16s Obs. alt. ☉....14° 29′ 40″
8h 12m 46s 14° 34′ 50″
8h 13m 18s
3)42° 87′ 130″
3)24h 38m 20s
14° 29′ 43″
Mean 8h 12m 47s
C-W ..... 2h 50m 16s Table 46..... 6′ 50″
I.C. ..... — 30″
C.T. 11h 03m 03s
C.C. ..... — 1m 51s Corr. ..... 6′ 20″

G.M.T. .....23h 01m 12s Alt. .....14° 36′ 03″
Eq.t. ..... + 15m 15s

G.A.T. 23h 16m 27s

Dec. at 22h .... = 18° 35.5′ Eq.t. ..... = 15m 15.5s

H.D. ..... 0.6′ H.D. 0.4s
Int. ..... 1.0′ Int. 1.0s

Corr. ..... 0.6′ Corr. 0.4s

Dec. ..... — 18° 36.1′ Eq.t ..... + 15m 15.1s
90°00.0′

Polar dist..... 108° 36.1′

Altitude ..... 14° 36′ 03″
Latitude ..... 39° 12′ 00″ log. sec....10.11073
Polar distance...108° 36′ 06″ log. csc.....10.02330

Sum .....2)162° 24′ 09″

Half sum..... 81° 12′ 04″ log. cosine.. 9.18459
Altitude ..... 14° 36′ 03″

Remainder ..... 66° 36′ 01″ log. sine.... 9.96273

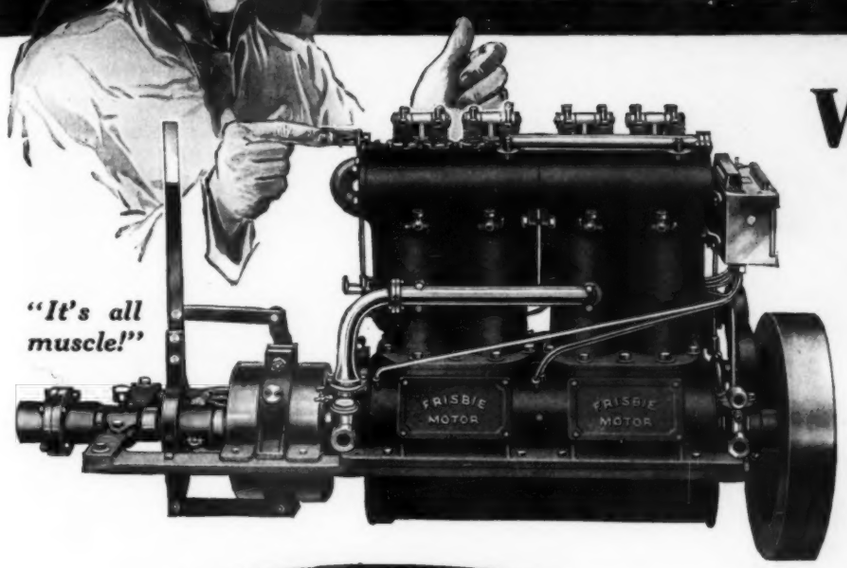
Log haversine L.A.T..... 9.28135

G.A.T. 23h 16m 27s
L.A.T. 20h 32m 36s

Long. ..... 2h 43m 51s = 40° 57′ 45″
Azimuth of ☉ from tables = 129° (by interpolation)
Bearing of ☉ = S 51° E
A. M. position:—Lat.....39° 12′ N
Long.....40° 57.7′ W

(*Continued on page* 88)

Frisbie an' I



"It's all muscle!"

We Power Boats That Do Real Work!

Frisbie VALVE-IN-HEAD MOTOR

the friendly motor

A MOTOR that will pull a ponderous boat 9000 miles without adjustment, without breakage (except one spark plug), and on 5 qts. of gas an hour;

—or, a heavily loaded, 27-ft. bank skip at 7 miles an hour, averaging 25 miles a day, working 7 days a week;

—or, one that will carry your cargo thru icy waters steadily, day after day, without getting tired of the job;

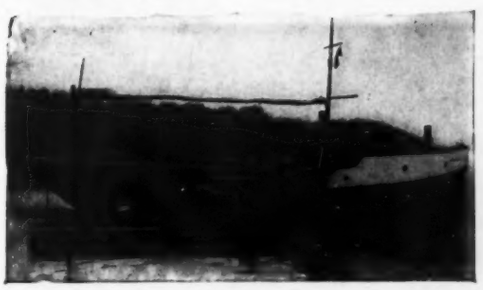
THAT'S the kind of a motor the Frisbie is—and why it powers so many boats that do **real work.**

The Frisbie is an honest, true-blue friend. Clean and simple; no fluffy ruffles, but giant power in every piston stroke. Good for years of heavy duty at low cost.

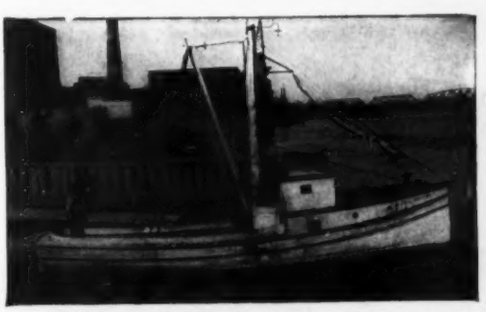
One big point users invariably comment on, is the striking distances it will go without "missing" or needing repairs. The Frisbie is an eternal joy and a lifelong investment to its owner.

Send for the FRISBIE BOOK

It describes the full line from 1 to 6 cylinders, and from 3 to 75 horsepower. Lots of boat pictures and data. Glad to send it without charge to serious minded boat owners. Get it now before the season starts in earnest.



"Nadine," Greenport, N. Y. Run Boat. 13 Tons Under Deck. 38 ft. x 13 ft. x 4½ ft. 25 H. P. Three Cylinder Frisbie Motor.



"Five Sisters," East Marion, N. Y. 33 ft. x 10 ft. Otter Trawler. 25 H. P. Three Cylinder Frisbie Motor.

Columbia River 15 Ton Salmon Run Boat. 45 ft. x 10 ft. 30 H. P. Four Cylinder Frisbie Motor

THE FRISBIE MOTOR CO., 7 College St., Middletown, Conn.

Sub-chasing jackies praise the Berling

Machinist's mate on the flagship of a fleet of sub-swatters writes—

"I cannot praise our Berlings too highly—and would not exchange them for any other magneto. I have the greatest confidence in their steady, strong spark."

ERICSSON MFG. COMPANY
BUFFALO, N. Y.

Berling Magneto

WORTH MORE DOES MORE

Practical Navigation

(*Continued from page 86*)

Comp. Course	Var.	Dev.	Error	True C.	Dist.	N	S	E	W
87°	25° W	2° W	27° W	60°	55	27.5	—	47.6	—

Lat. left.....39° 12.0′ N Long. left.....40° 57.7′ W
Diff. lat..... 27.5′ Diff. long..... 1° 01.0′ W

Lat. in.....39° 39.5′ N Long. in.....39° 56.7′ W

Noon sight:—Obs. alt. ☉ .32° 21′ 30″ S Table 46..... = 9′ 06″
Corr. ..... 8′ 36″ I.C. ..... = —30″

Altitude ...32° 30′ 06″ Corr. ..... 8′ 36″
90° 00′ 00″

Zenith dist.57° 29′ 54″
Declination.18° 38′ 24″

Noon lat....38° 51′ 30″

L.A.T. .....0h 0m 0s Dec. at 2h. = —18° 38.0′
Long. .....2h 44m 8s H.D. ..... 0.6′
G.A.T. .....2h 44m 8s Int. ..... 0.7′
Corr. ..... 0.4′
Dec. ..... 18° 38.4′ S

Noon lat. by D.R...39° 39′ 30″
Actual noon lat....38° 51′ 30″

Error ..... 48′ 00″ too far North

Long. .....39° 56.7′ W Longitude factor from Table 47 = 1.06
Error ..... 50.9 W .48

True long.....40° 47.6′ W 8.48
4.24

Error in long..... = 50.88′

Noon position:—Lat.....38° 51.5′ N
Long. ..40° 47.6′ W

Problem 4. July 5, 1918, the position by dead reckoning at 7h 40m a. m. is Lat. 51° 34′ N Long. 32° 19′ W, the patent log reading 13.0. A time sight for longitude is taken, the height of eye is 12 ft. Index correction 0′ 0″. C.C. — 17m 33s. Chronometer time of sight (no watch was used, the time of the sight being directly noted by the chronometer) 9h 58m 16s. Obs. alt. ☉ 30° 51′ 50″.

A course 240° (true) is set and continued until 10h 30m a. m., at which time the log reads 45.0 and a time sight gives the following results, the height of eye, index correction, etc., being as before.

Chronometer time of sight 12h 48m 40s. Obs. alt. ☉ 54° 55′ 00″. Solution by St. Hilaire's Method:—

C.T. ..... 9h 58m 16s Eq.t. on July 4 at 20h = — 4m 12.2s
C.C. ..... — 17m 33s H.D. ..... = 0.5s
G.M.T. .....21h 40m 43s July 4 Int. 1.7s
Eq.t. ..... — 4m 13s Corr. 0.8s
G.A.T. .....21h 36m 30s Eq.t. 4m 13.0s
Long. 2h 9m 16s
L.A.T. 19h 27m 14s

Dec. at 20h = + 22° 51.8′ L.A.T. ..19h 27m 14s log. hav. = 9.49727
H.D. .... = 0.2′ Lat. .....51° 34′ 00″ log. cos. = 9.79351
Int. ..... 1.7′ Dec. ....22° 51′ 30″ log. cos. = 9.96448
Corr. .... 0.3′ Log. hav. θ..... = 9.25526
Dec. .... 22° 51.5′ N Nat. hav. θ..... = .18000
L ~ d = 28° 43′ 30″ nat. hav. = .06153
Nat. hav. Z.D..... = .24153

Obs. alt. ☉ .30° 51′ 50″ 90° 00′ 00″
Zenith dist.....58° 52′ 15″
Table 46..... 10′ 57″
I.C. ..... 0′ 00″ Calculated alt..31° 07′ 45″
Alt. .....31° 02′ 47″
Alt. .....31° 02′ 47″ Alt. diff..... 4′ 55″ say 5.0′ away from the sun.

Azimuth of sun 92°

True C.	Dist.	N	S	E	W
240°	32	—	16.0	—	27.7

(*Continued on page 90*)

Columbian Propellers

Are Used Exclusively on Great Lakes Craft

The Great Lakes Boat Building Corporation use Columbian Propellers on all their standardized Great Lakes Express Cruisers and Runabouts simply because they have proved Columbian Propellers to be more efficient in actual service than any other propeller obtainable.

The maximum of speed and dependability are demanded by the Great Lakes Boat Building Corporation from all propellers supplied for their boats. Columbian Propellers have given them just that.

There is a Columbian Propeller designed and built for YOUR boat, no matter whether that boat be a work boat, an auxiliary, a big cruiser or a little one. Write to-day for "Propellers-in-a-Nutshell"—it tells you all about propellers for YOUR boat.

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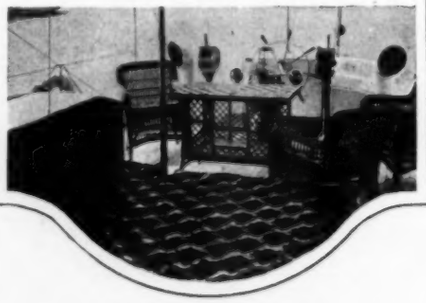

Write for Booklet and Samples

Practical Navigation

(*Continued from page 88*)

Lat. left	51° 34′	Long. left	32° 19′ W
Diff. lat.	16′	Diff. long.	44′
Lat. in	51° 18′	Long. in	33° 03′ W
Mid. lat.	51°		

C.T.	12h 48m 40s	Eq.t. July 5 at 0h	= — 4m 14.0s
C.C.	— 17m 33s	H.D.	0.4s
G.M.T.	0h 31m 07s July 5	Int.	0.5s
Eq.t.	— 4m 14s	Corr.	0.2s
G.A.T.	0h 26m 53s	Eq.t.	— 4m 14.2s
Long.	2h 12m 12s		
L.A.T.	22h 14m 41s		

Dec. at 0h	= + 22° 50.9′	L.A.T. = 22h 14m 41s	log. hav. = 8.71491
H.D.	= 0.2′	Lat.	= 51° 18′ 00″ log. cos. = 9.79605
Int.	0.5′	Dec.	= 22° 50′ 48″ log. cos. = 9.96452
Corr.	0.1′	Log. hav. θ	= 8.47548
Dec.	22° 50.8′ N	Nat. hav. θ	= 0.02989
		L ~ d = 28° 27′ 12″	nat. hav. = 0.06040
		Nat. hav. Z.D.	= 0.09029

Obs. alt. ⊙	= 54° 55′ 00″		90° 00′ 00″
Table 46	= 11′ 45″	Zenith dist.	= 34° 58′ 30″
I.C.	0′ 00″		
Alt.	55° 06′ 45″	Calculated alt.	= 55° 01′ 30″
		Alt.	55° 06′ 45″
		Alt. diff.	05′ 15″ towards sun.

Azimuth of sun 115°

See diagram for actual finding of the vessel's position.

(*The End*)

Motor Boating This Summer

(*Continued from page 7*)

facts in a more sensible and sane light, the situation would be improved for everyone. Everyone knows that there are extensive naval operations in progress in certain places—the Lower Bay between the Narrows and Sandy Hook, for example. This particular body of water in the past has literally been infested, on Saturdays and Sundays, with pleasure motor boats of all kinds and descriptions, seaworthy and otherwise, some overcrowded, many improperly handled and lacking in equipment, boats with balky motors and some with engines which would not run at all,—most of the craft bound nowhere at all, just out for a few hours of joy-riding.

It doesn't take a naval officer to see that such a crowded condition of the waterways might seriously interfere with important naval operations which are in progress on certain parts of this body of water.

Naturally, no motor boatman, if he gives the subject a moment's thought, wants to interfere with any of the Government's plans or experiments for the winning of the war or even provide a possible means for anyone who should not see or learn what is going on. If one was out for an afternoon stroll on land, he would not think of walking down to a Government fort and looking into the muzzle of a ten-inch gun, just at present. Probably more than one sentry would have something to say before one got very far into such a Government reservation.

Why then should not the Government be entitled to just as much consideration on the seas as on land? Why should not the water sentry, the patrol boat, have something to say when you attempt to go into such dangerous waters where even the most powerful battleship is likely to end her career in a few seconds' time?

But even in spite of all this, the Navy Department is very considerate. While the Department says, for example, that you must proceed with caution in the Lower Bay and keep out of Ambrose Channel entirely, yet it provides alternate routes which it will permit the motor boatman to follow if he must. For instance, between a line drawn from Bell-buoy No. 18 to Ambrose Channel Lightship and a line drawn from Bell-buoy No. 6 to Scotland Lightship no motor boats are allowed. Yet they may proceed at will either north or south of these two limits. Why is it not just as easy and convenient when proceeding down the Bay to go via some one of the many other channels as it is by way of a certain channel which is given up to much more important and serious purposes? Even to go around the ends when it is desired to cross is not such an awful hardship.

There are very few of these barred zones on the Atlantic seaboard. A letter addressed to the Commandant of your naval district will bring the information to you—where they are and how to proceed. In the Third Naval District, the most important district of all, there is only one: the Narrows at New York City.

To pass out to sea through one of these barred zones a permit must be obtained from the proper naval officer at the naval headquarters for

(*Continued on page 92*)

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"Spark-in-Water" Champions

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That's proof positive that mere moisture *can't* short it.

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Motor Boating This Summer

(*Continued from page* 90)

the district. To obtain this permit the boat owner must satisfy the naval officer as to the identity of himself and those aboard his boat. Such a permit will be good for that trip only and must be used within twenty-four hours.

Away from the barred zones, boats will not be molested other than by the right which every naval officer always has had of search for alien enemies aboard any craft at any time. But one who behaves himself on the water or does not arouse suspicion has nothing to fear.

As in 1917 a Navy Department permit will be required to sail on the waters of any naval district. But such a permit will be granted to citizens for the asking. A permit obtained in 1917 will *not* have to be renewed in 1918 and will be good until canceled by the Navy Department. Boats cruising from one naval district to another will *not* be required to have a separate license for each district. A license from their home district will suffice.

To use a motor boat during the coming summer the receipt from the Collector of Customs showing that the war tax has been paid will have to be carried on board at all times. Navigation, naval and custom officials will have power to inspect boats to determine whether the war tax has been paid.

To those few who are in the vicinity of one of the forbidden zones there may be a little more red tape than we are accustomed to. But isn't the fault all our own? Haven't we begun to believe that we own the waters of the globe? We have so long been accustomed to everything as free as the air that now, when we are asked to make our own little oceans safer places to sail and enjoy ourselves upon, we become a little nettled and complain that boating is being restricted.

If you own a car, do you ever think that your rights are jeopardized because your state authorities require you to register your car and obtain a license every year? Do you write a letter to the President of the United States if a traffic officer holds up your progress several minutes at some important street junction? Even if such a thing happens, as it will, fifty or sixty times a day, do you do more than fret a little? If you come to a one-way street or a street car safety zone, do you decide to sell you car because there are so many restrictions on motoring? Of course you don't. Then why not enjoy motor boating as usual which has far less inconveniences than any other sport or pastime?

Plane Facts

(*Continued from page* 16)

wing—and this is generally about one-third of the distance from the front edge of the wing at flying angles—and with these results available, together with the knoweldge of his engine's horsepower and the weight to be carried, can design his plane within 2 or 3 per cent of the actual performance which is shown after the machine is constructed. A large number of wing curves are available with definite data regarding air performance. Eiffel of Paris, has developed a large number of curves. The U. S. A. curves developed at the Massachusetts Institute of Technology by government engineers are well known and understood. Curves of the Royal Aircraft Factory in Great Britain and especially the R. A. F. No. 6 have been popular with American designers, although this one is now largely superseded by newer curves. As a wing travels through the air, the impact naturally is heavier toward the leading edge of the plane than on the rear surfaces where the striking air is more or less deadened from the reaction on the front surface; thus the pressure toward the leading edge of the wing is greater than toward the rear and the center of all pressures on the wing. thus comes about a third of the way back from the leading edge. This varies, however. With one wing curve, when you bring the flying angle down, say to 2 degrees, the center of pressure may go clear forward. On another wing curve at equal angles, the center of pressure might move far to the rear due to the pressure of the bow wave on top of the wing in front, thus tending to make the machine dive. The same might be true at steep angles and all of this movement of the center of pressure from front to the rear of the plane for any given wing curve is of interest to the designer that he may have the tail surfaces large enough, and in proper proportion to control this center pressure movement. The ideal wing curve, of course, would have a fixed center pressure which would not move forward or aft as the angle of wing attack changed.

The next article will take up the matter of control surfaces and their relation to plane surfaces and discuss some of the more detailed elements of plane construction.

Motor Boatman Designs

(*Continued from page* 17)

of the speed boat left to land. Otherwise he is a good flier.

It is significant, however, that he gets his information regarding Liberty engines and American planes first hand, without depending on hearsay alone, and does the work in the thorough way that has made the name Vincent one to conjure with in automotive engineering circles. He is a great engineer, first because he is great personally; a great organizer, a great go-getter, and a great analyst. He attacks all problems from fundamentals rather than details, but does not let details escape. When he marks a job done, it is done as far as that season's effort allows, but be sure he will have some new surprises for later seasons and programs!

The story of his creation of the Liberty engine from the idea to the completed engine within a month's time is one of the big romances of engineering. When the war is over he will be known for even greater achievements and will be looked up to as one of the great geniuses of American creativeness.

Buy a *Good* Motor

The only motor you can afford to own is the best motor you can buy. Steady service, high efficiency, good economy and freedom from mechanical troubles are more important than a few dollars saved on the first cost.

It costs real money to build good motors these days. Present material and labor costs have necessarily advanced prices somewhat. You must expect to pay a little more. You get just what you pay for —only the bargain hunter gets less than his money's worth.

Prices may not go down for several years to come. They may advance several times before they recede. You can save nothing by waiting. Buy your new motor now, and enjoy life while you can—but buy a **good** motor—for real service.

Practically every better grade motor on the market today carries a Paragon Reverse Gear as standard transmission equipment. That in itself is an indication of the manufacturer's policy — whether it is "Quality" or "Price."

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The Galusha Gas Producer

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Dear Sir:

I have a 50 H.P. Galusha Gas Producer in connection with a 60 H.P. engine installed in my passenger boat the "Chicago," plying between Lincoln Park the Municipal Pier and Grand Park.

Here is a brief report or data of the operation during this Summer:

I have run my boat every day (a few rainy days excepted) from about 9 A. M. to 11 P. M. without losing one minute, and I run the engine "dead slow" at the docks without any danger of stalling. This shows absolute reliability.

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To prove my satisfaction, I will add that I shall most certainly install this kind and make of power in my next boat.

Very truly,
(Signed) FRED WEIMER.

The Galusha Gas Producer generates gas for any make of gasoline engine from cheap grades of coal. It is complete and compact, automatic in operation, requires little attention and occupies little space. By actual experiences in scores of boats the fuel cost is only one-tenth as much as gasoline and one-fourth as much as steam. The first cost and fuel cost is much lower than for Diesel and other engines.

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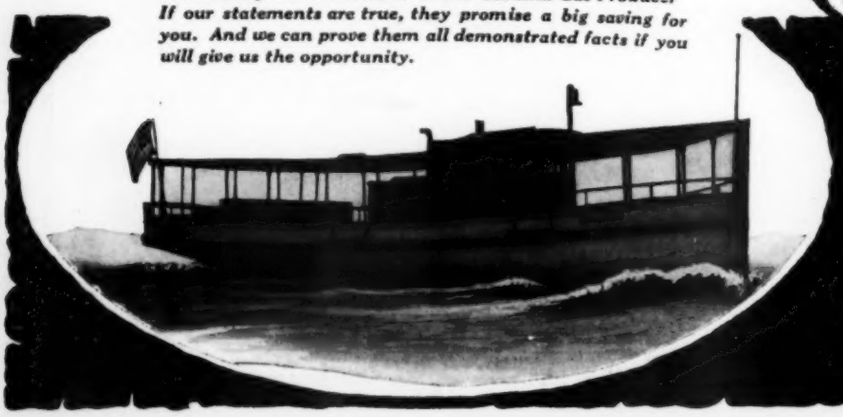

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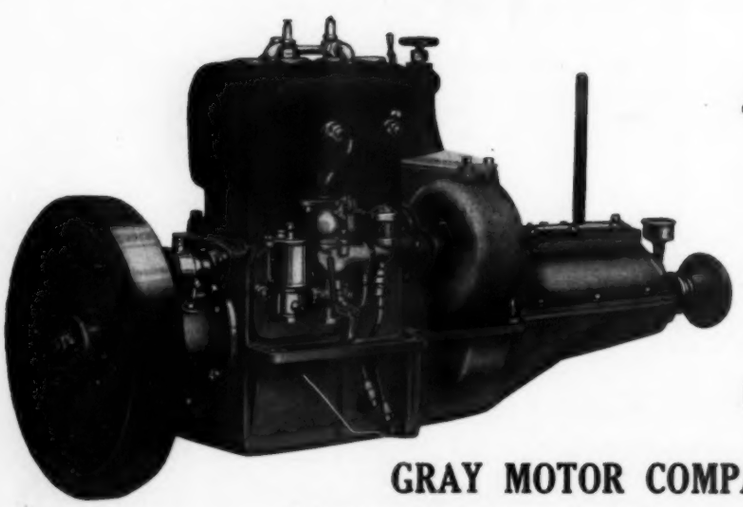
Mr. Hamilton tells us: "On several occasions when I was making landings with my 4-D Gray other boatmen would say: 'I can't hear it; you must have an electric motor.'"



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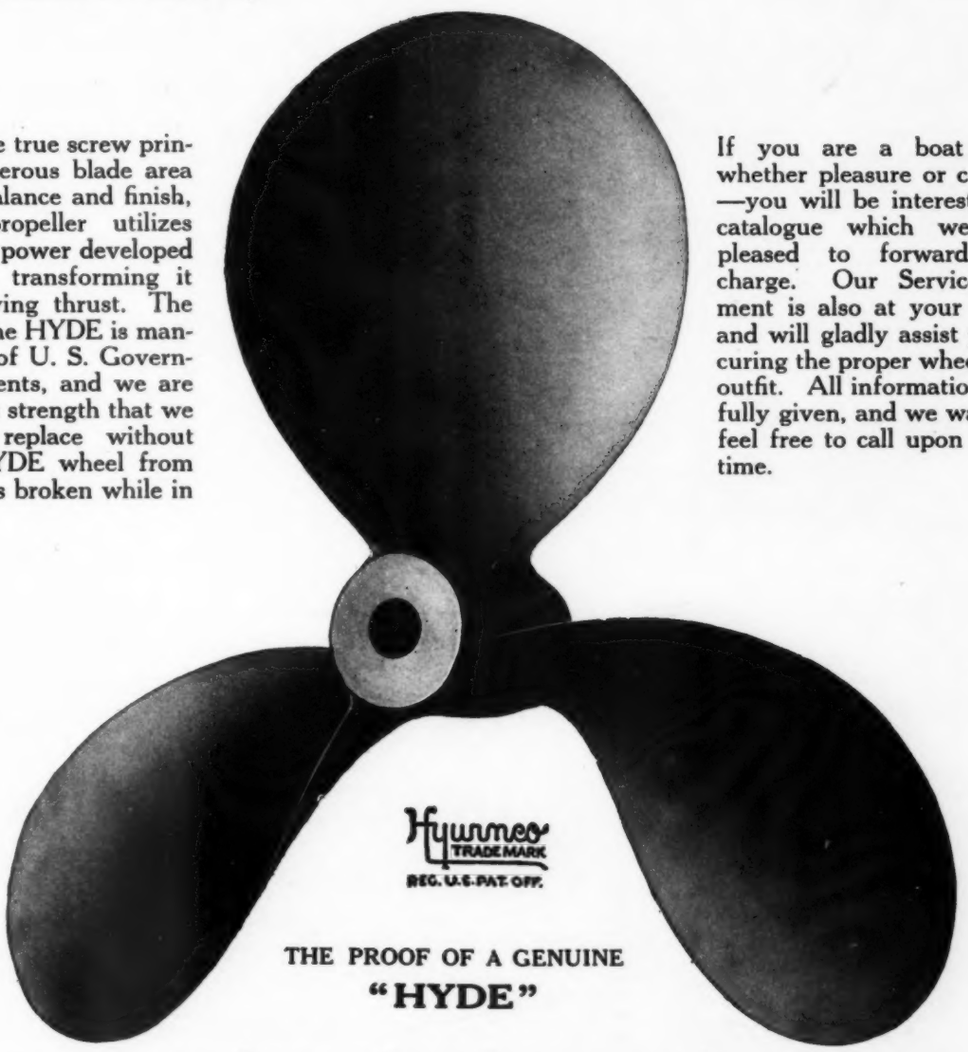

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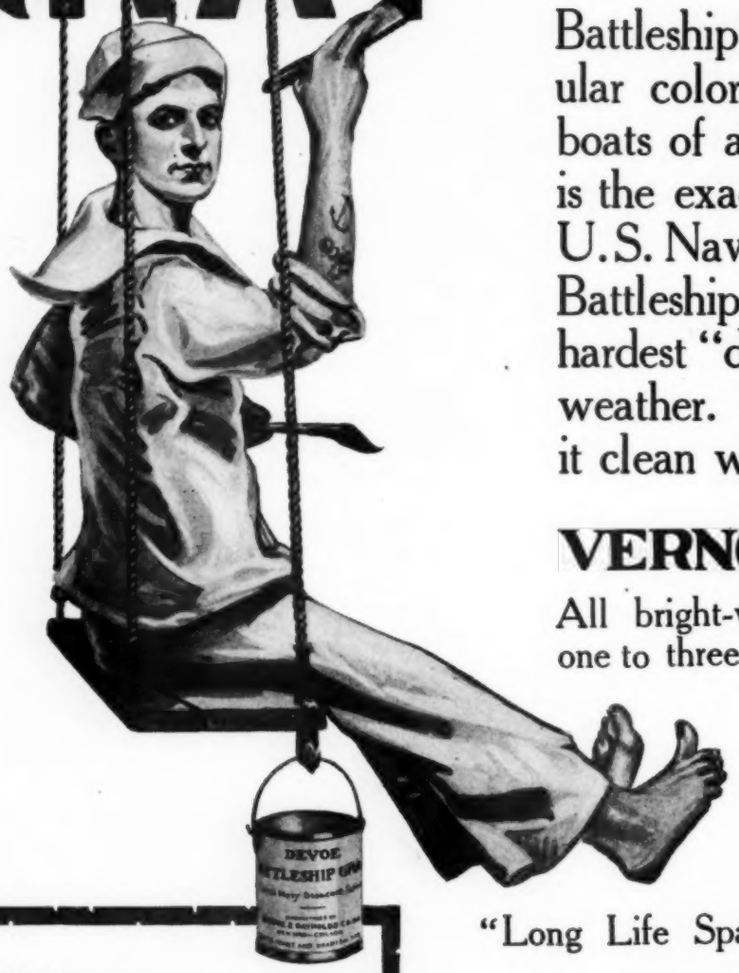

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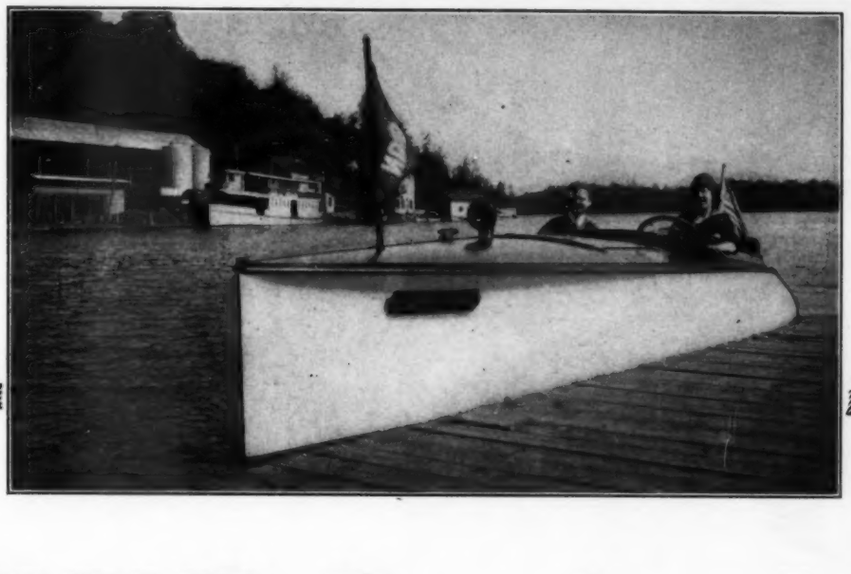
NEW YORK—CHICAGO



Let YOUR Daughter Do It

A Fay & Bowen "JUNIOR RUNABOUT" is an ideal boat for your daughter or your wife to operate.

24 ft. long and 5 ft. beam, not too large to handle and control with ease, it has a ten-foot cockpit, and between the back of the forward seats and the front of the rear seat there is a clear space of five feet giving ample room for chairs.

Of construction, equipment and finish, it is sufficient to say that they are up to the high standard of all Fay & Bowen boats.

Under date of Nov. 19th, 1917, a client writes us:

> *"The Junior Runabout I bought from you in the spring of 1916 has run absolutely perfect. In the two years the boat never refused to start, or stopped, or needed adjustment, and I have not paid a cent for repairs. During all this time the boat has been handled and run entirely by my daughter."*

The picture above shows the boat to which this customer refers.

Another client, a young girl, writes us under date of Jan. 17th, 1918, about her Junior Runabout:

> *"It runs beautifully and has given me no trouble whatever."*

Write and ask us for full particulars of this boat and its equipment, or for corresponding information about our other sizes and models.

And don't forget our full line of engines. "None better built."

Four-cycle Engines
Two-cycle Engines
Finished Motor Boats
Electric Lighting Units
and Pumping Sets

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104 Lake Street, Geneva, N. Y., U. S. A.

New York Office: 50 Church Street, on Concourse, Sutter Bros., Representatives
Made for Canada by the St. Lawrence Engine Co., Ltd., Brockville, Ont.

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Cutting Down Manufacturing Costs by the Lawrence PATENT PROCESS

Cut down the production cost on your motor, Mr. Manufacturer, by reducing the number of scrapped castings. In normal times you can perhaps afford to throw out cylinder castings which show slight defects. But today, with the shortage of materials and labor, you must eliminate waste and scrap by every method you can find.

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By our exclusive *patented process* we electrically fuse a silver-nickel alloy into the defects or scores. This is done WITHOUT warping or harming the cylinders in any way. It leaves them in perfect condition, and to the contour of machined bore.

The Lawrence Process has been applied to hundreds of new and used cylinder castings in the past few years. The work is done by a firm established more than half a century ago. The names of a few of our regular customers, together with an inspection of our work, will convince any engineer or motor owner who care to investigate.

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Mention size of cylinder and defect.
Please address nearest Service Plant.

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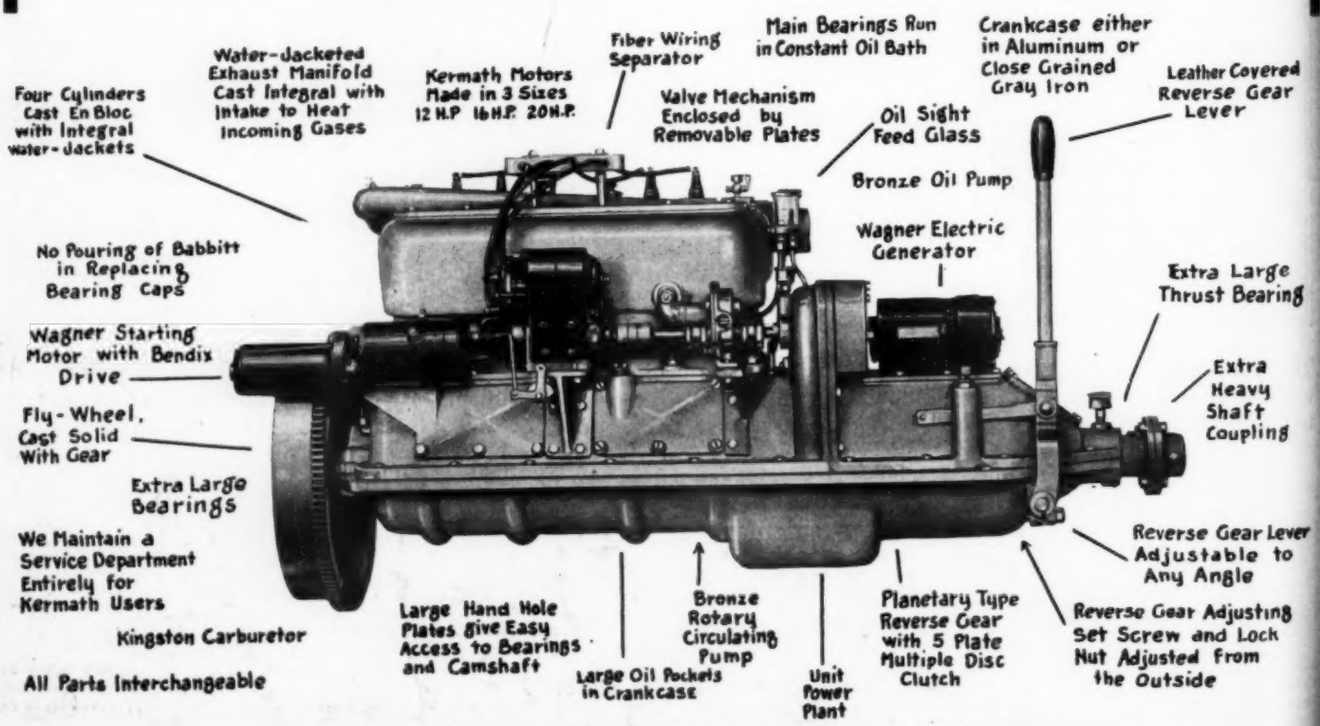
$295 and up.	$320 and up.	$370 and up.

KERMATH MANUFACTURING CO., Dept. 2, Detroit, Mich.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